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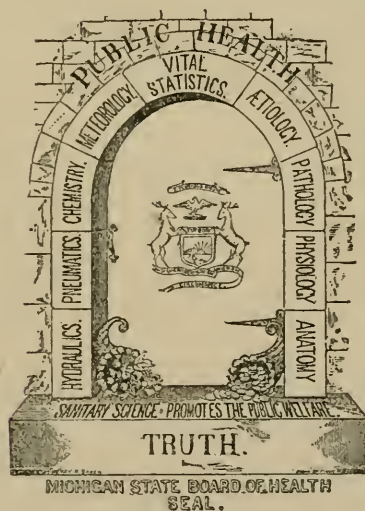








TWELFTH ANNUAL REPORT  
OF THE  
SECRETARY  
OF THE  
STATE BOARD OF HEALTH  
OF THE  
STATE OF MICHIGAN,  
FOR THE  
FISCAL YEAR ENDING SEPTEMBER 30, 1884.



BY AUTHORITY.

LANSING, MICH.:  
W. S. GEORGE & CO., STATE PRINTERS AND BINDERS.  
1885.



Office of the Secretary of the State Board of Health, }  
LANSING, MICHIGAN, *December, 1884.*

To Hon. JOSIAH W. BEGOLE, *Governor of Michigan:*

SIR:—In compliance with the laws of this State, I present to you the accompanying Report for the fiscal year ending September 30, 1884.

Very respectfully,

HENRY B. BAKER,  
*Secretary of the State Board of Health.*

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN  
ITS ANNUAL REPORT.

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*Resolved*, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.”

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# REPORT.

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This is the twelfth Annual Report of the Secretary of the State Board of Health, and is for the fiscal year ending September 30, 1884. It is arranged and paged in two parts. The first contains the Secretary's report of work of the Board, the annual report of property, including accessions to the library with names of donors, and certain special reports and communications. The second part contains eighteen papers, abstracts, and reports, mostly by members of this Board, fifteen of which were prepared in the office of the Secretary.

To this Report there are supplements containing proceedings and addresses at the sanitary conventions held at Ionia, December 13 and 14, 1883; and at Hillsdale, April 17 and 18, 1884.

The papers are printed subject to the following resolution of the Board:

"Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who is entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein."

The names and postoffice addresses of the members of the Board, and the date of the expiration of their terms of office, at the close of the fiscal year, are as follows:

HENRY F. LYSTER, A. M., M. D., Detroit, Jan. 31, 1885.

JOHN H. KELLOGG, M. D., Battle Creek, Jan. 31, 1885.

ARTHUR HAZLEWOOD, M. D., Grand Rapids, Jan. 31, 1887.

JOHN AVERY, M. D., *President of the Board*, Greenville, Jan. 31, 1887.

VICTOR C. VAUGHAN, M. D., Ph. D., Ann Arbor, Jan. 31, 1889.

C. V. TYLER, M. D., Bay City, Jan. 31, 1889.

HENRY B. BAKER, M. D., *Secretary of the Board*, Lansing.

## STANDING COMMITTEES.

1. Epidemic, Endemic and Contagious Diseases,—H. F. Lyster, M. D.
2. Sewerage and Drainage,—H. F. Lyster, M. D.
3. Foods, Drinks, and Water-Supply,—V. C. Vaughan, M. D.
4. Buildings, Including Ventilation, Heating, etc.,—John Avery, M. D.
5. Climate, Geology, Topography, etc.,—Henry B. Baker, M. D.
6. Disposal of Excreta,—John H. Kellogg, M. D.
7. Poisons, Explosives, etc.,—V. C. Vaughan, M. D.
8. Occupations, Recreations and Habits,—J. H. Kellogg, M. D.
9. Relations of Schools to Health,—John Avery, M. D.
10. Sanitary Survey, C. V. Tyler, M. D.

11. The Death-Rate, as Influenced by Age,—Henry B. Baker, M. D.
12. Legislation,—C. V. Tyler, M. D.
13. Finances of the Board,—Arthur Hazlewood, M. D.
14. Mental Hygiene,—Arthur Hazlewood, M. D.
15. Diseases of Animals Dangerous to Man,—Henry B. Baker, M. D.
16. Relations of Preventable Sickness to Taxation,—John H. Kellogg, M. D.

### WORK OF THE OFFICE OF THE BOARD, FISCAL YEAR 1883.

The work of the office naturally groups itself under three closely related heads,—the collection of information, the compilation and elaboration of information, and the dissemination of information. In the following outline that grouping has been made in part only in order to avoid repetition.

### COLLECTION AND COMPILATION OF INFORMATION.

#### ANNUAL REPORTS BY HEALTH OFFICERS FOR THE YEAR ENDING DEC. 31, 1883.

In January, 1884, a circular (65) which had been approved by the Board, was sent to the health officer of each township, city, and village in the State, about 1,391 in all, transmitting a blank form [I] for use in making his annual report to this office. This circular was substantially the same as circular 57 which was sent the year before. It is printed on this page of this Report. The circular (65) also transmitted a blank for a copy of the record of diseases dangerous to the public health, similar to the blank which is printed, reduced in size, on page 271 of the Report for 1882.

#### ANNUAL REPORTS BY CLERKS OF LOCAL BOARDS OF HEALTH, FOR THE YEAR ENDING DEC. 31, 1883.

At the same time (January, 1884) that the circulars and blank forms were sent to the health officers, a circular (66) asking for a report, and a blank form [J] on which to make a report, were sent to the clerk of the local board of health of each township, city, and village in the State, about 1,391 in all. A blank form for a copy of his record of cases of diseases dangerous to public health was also sent, the circular and blank form sent to the clerk were similar to those sent to the health officer, except that they were not so explicit in questions relating to sickness and deaths.

Circular 65 is as follows:

[65.]

OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH,  
Lansing, Michigan, December, 1883. }

*To the Health Officer :*

SIR:—Herewith I send you a blank form (I) for your use in making your Annual Report to this Board, required by law,\* for the year ending December 31, 1883. Please fill out and return the report as soon as possible.

The blank form sent to you is somewhat similar to one sent to the clerk of your board, but your report should be made according to your best knowledge, leaving his report to be made by him according to his best knowledge. If each of you will report to this office the cases reported to himself we will then know the total number of cases reported, and to which class of officers the greatest number of reports are made; and if we have estimates of the probable number of cases not reported, made by two different persons in each locality, we may gain a good idea of the actual condition of the public health and of the public-health service in the different parts of the State. As soon as sufficiently accurate and complete reports are received from such a proportion of the localities as will be fairly representative, it is designed that they shall be compiled and published. Although many specific facts have been learned from the reports of those health offi-

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\* Act No. 81, Laws of 1873, Sec. 8.—It shall be the duty of the Health Physician and also of the clerk of the local board of health in each township, city, and village in this State, at least once in each year, to report to the State Board of Health their proceedings, and such other facts required, on blanks and in accordance with instructions received from said State Board. They shall also make special reports whenever required to do so by the State Board of Health.

cers who have made satisfactory reports, general truths concerning the entire State cannot well be reached by the compilation of reports when only the most healthy or the most sickly townships of many counties are represented; it is therefore important that every health officer shall make a report. For a similar reason, every blank should be filled. If no sickness has occurred within your jurisdiction, or if there has been no case of any disease concerning which a report is asked, it is important to state that fact, and the reason, if known, for such healthfulness, and also the population, etc., in the blank spaces provided for those statements in the report. It is also important to fill the blanks for the probable number of cases of diseases not reported to you. It is necessary to have uniform blank forms, because it is impossible to compile from letters and postal cards, on account of the time required to search through them; and for this reason, every fact to which the report relates should be entered in its proper place in the report, and no character of uncertain meaning (as a dash or an  $\times$ ) should be used when the question can be answered in words or figures. The dash should be used only to indicate that a blank which needs no word or figure to express the truth has not been overlooked.

Your report should be made out for the exact territory over which your board has jurisdiction, and for which you are the health officer, and it should not include anything outside of such jurisdiction. A township board of health does not have jurisdiction in an incorporated village, even though such village be situated within the limits of the township. If you have been appointed health officer for a township and an incorporated village, it is necessary that you make separate reports for each, just as separate as if they were made by different persons.

Please ascertain and report as completely as possible the causes of all fires within your jurisdiction during the year 1883; also the number of lives lost, and of persons injured in consequence thereof.

I send you a blank sheet for your Report of Cases of Diseases Dangerous to the Public Health. If you have any cases on your Record, please fill out and return this report as soon as possible. If you have more cases to report than can be reported upon one side of a sheet (28), please write to this office for blanks, stating the additional number of sheets you need. If you have no case to report, please send a definite statement to that effect in paragraph 11 of the blank form; and whether you have cases recorded or not, please state in paragraph 10 of the blank form your belief as to the number of cases of each of such diseases that have occurred within your jurisdiction that have not been legally reported to you.

The blank which I send for your report of Cases of Diseases is essentially the same form as the one several times recommended by this Board as a proper form for a record of such cases. For the purpose of beginning or continuing such a Record, you can purchase from the printers, for eighty cents per quire or three dollars per hundred, sheets similar to the one sent herewith, except that they are for a Record instead of a report. For a permanent record the sheets should be bound in blank-book form. The printers will also supply, for one dollar per hundred, blank notices for the use of householders and physicians in complying with sections 1734 and 1735, compiled laws of 1871, as amended by Act No. 11, laws of 1883, which sections require householders and physicians, under liability to a fine for non-compliance, to report to the local board of health cases of disease dangerous to the public health. In connection with these notices, your attention is respectfully asked to Act No. 157, Laws of 1879, which requires health officers of cities and villages to notify the prosecuting attorney of the failure of householders and physicians to give notice of diseases dangerous to the public health. It is again recommended that your board of health have copies of these blank notices thoroughly distributed within your jurisdiction, in order to call attention to the law, and secure material for a complete record in your office, relating to diseases which endanger the public health.

It is not expected that it will always be possible, from the notices which you receive, to fill every column of your record; but so much as it is possible to learn concerning each case, should be recorded and reported, because the single fact of the number of cases of sickness from each such disease will be of value in connection with the records of deaths and other knowledge collected at this office. It is hoped that you will not fail to record all cases of such diseases under your own care.

The document on the "Restriction and Prevention of Scarlet Fever," and the document on the "Restriction and Prevention of Diphtheria," have been revised and reprinted by the State Board of Health. A document on the "Prevention and Restriction of Small-Pox" has also been printed. Each document has been stereotyped by the State Board. A number of copies of either of these documents may be obtained for distribution by any board of health, by applying to the Secretary of the State Board of Health, Lansing, Mich. These documents have also been printed in the German and in the Holland languages.

In case small-pox, scarlet-fever, diphtheria, or any other disease which endangers the public health, should appear in your locality, please make a special report of the fact to this office as soon as possible. Any aid which it may be possible for the State Board of Health to render will be promptly given.

It is expected that you will prevent such a disease from becoming epidemic, and that you will also study and record the conditions coincident with the rise, progress, and decline of any such outbreak, and in due time report the same to this Board. Concerning every such occurrence you should be able to report some facts which will be of use in advancing the cause of public health.

By direction of the State Board of Health.

Very respectfully,

HENRY B. BAKER, *Secretary.*

(Please preserve and file the circulars which you receive from this office.)



The blank form [I], for report of health officers, is as follows:

**HEALTH OFFICER:—**

Before filing any blanks, please read carefully through the entire form including foot-notes and instructions. PLEASE FILL ALL BLANKS.

[I.] DO NOT CHANGE OR MARK OUT ANY PRINTED MATTER.

To the Secretary of the State Board of Health: Sir,—This ANNUAL REPORT TO THE STATE BOARD OF HEALTH by the HEALTH OFFICER of the\* ..... of ..... County of ..... State of Michigan, FOR THE YEAR ENDING DECEMBER 31, 1883, consists of this form with\* ..... a Report of Cases of Diseases Dangerous to the Public Health,† which have occurred in this\* ..... during the year above stated, which isb ..... sent herewith on ..... separate sheet .....

1. To the best of my knowledge and belief, the ratio of deaths (from all causes) to inhabitants in this\* ..... during the year ending December 31, 1883, was\* ..... than the average of previous years.

2. The increase of the death rate was probably due to .....

3. I estimate the number of inhabitants in this\* ..... at\* .....; and the number of deaths from all causes at\* .....

4. The per cent of deaths to inhabitants, during the year ending December 31, 1883, was .....

5. Compared with previous years the ratio of cases of sickness (from all causes) to inhabitants in this\* ..... during the year ending December 31, 1883, was\* ..... than the average.

6. The increase of the proportion of sickness was probably due to .....

7. The greatest number of the deaths was from the diseases or causes (named in the order of greatest number), as follows: .....

8. The greatest number of cases of sickness was from diseases (named in the order of greatest prevalence), as follows: .....

9. The number of deaths during the year ending December 31, 1883, from Diseases Dangerous to the Public Health,† is as follows:‡

From small-pox.....deaths;	from typhoid fever.....deaths;	from cerebro-spinal men-
from cholera.....deaths;	from measles.....deaths;	ingitis.....deaths;
from scarlet fever.....deaths;	from whooping-cough.....deaths;	from diphtheria.....deaths;
		from.....deaths;

10. To the best of my knowledge and belief, cases of Diseases Dangerous to the Public Health† have occurred within the jurisdiction of this board, during the year ending December 31, 1883, that have not been reported to me by the householders within whose families the cases occurred, or by the physicians in charge of said cases, as follows:‡ (These cases are included in the Statement in paragraph 12 below.)

Of small-pox.....cases;	of typhoid fever.....cases;	of cerebro-spinal men-
of cholera.....cases;	of measles.....cases;	ingitis.....cases;
of scarlet fever.....cases;	of whooping-cough.....cases;	of diphtheria.....cases;
		of.....cases;

11. The numbers of cases of diseases on my record, which I report at this time in detail on the blank for that purpose, are as follows:‡

Of small-pox.....cases;	of typhoid fever.....cases;	of cerebro-spinal men-
of cholera.....cases;	of measles.....cases;	ingitis.....cases;
of scarlet fever.....cases;	of whooping-cough.....cases;	of diphtheria.....cases;
		of.....cases;

12. Including the cases legally reported to me and those not so reported, the total numbers of cases of Diseases Dangerous to the Public Health,† which have occurred within the jurisdiction of this board during the year ending December 31, 1883, were to the best of my knowledge and belief, as follows:‡

Of small-pox.....cases;	of typhoid fever.....cases;	of cerebro-spinal men-
of cholera.....cases;	of measles.....cases;	ingitis.....cases;
of scarlet fever.....cases;	of whooping-cough.....cases;	of diphtheria.....cases;
		of.....cases;

13. The date of the first case of each disease was as follows:

Of small-pox,....., 188..;	of typhoid fever,....., 188..;	of cerebro-spinal men-
of cholera,....., 188..;	of measles,....., 188..;	ingitis,....., 188..;
of scarlet fever,....., 188..;	of whooping-cough,....., 188..;	of diphtheria,....., 188..;
		of....., 188..;

14. The date of the last case was as follows:

Of small-pox,....., 188..;	of typhoid fever,....., 188..;	of cerebro spinal men-
of cholera,....., 188..;	of measles,....., 188..;	ingitis,....., 188..;
of scarlet fever,....., 188..;	of whooping-cough,....., 188..;	of diphtheria,....., 188..;
		of....., 188..;

15. So far as known, the sources from which the diseases were derived were as follows:§

Of small-pox,.....;	of cerebro-spinal meningitis,...	of whooping-cough.....;
of scarlet fever,.....;	of cholera,.....;	of diphtheria.....;
of measles,.....;	of typhoid fever.....;	of.....;

16. I attribute theb ..... in this\* ..... during the year ending December 31, 1883, to the following causes or circumstances: .....

17. During the year ending December 31, 1883, the climatic conditions observed by me were as follows: .....

18. So far as I can ascertain, ..... fires have occurred in this\* ..... during the year ending December 31, 1883, from causes as follows: ..... and ..... lives were lost and ..... persons injured in consequence thereof.<sup>1</sup>

19. During the year ending December 31, 1883, I have attended ..... meetings of this board of health, and the following measures were adopted in the interest of public health: .....

20. During the year ending December 31, 1883, ..... persons have been vaccinated in this\*..... at public expense, and about ..... at private expense.

21. Cases of Diseases Dangerous to the Public Health<sup>†</sup> now prevail at time of completing and dating this report, as follows:

Of small-pox,.....cases;	of typhoid fever,.....cases;	of cerebro-spinal men.,.....cases;
of cholera,.....cases;	of measles,.....cases;	of diphtheria,.....cases;
of scarlet fever,.....cases;	of whooping-cough,.....cases;	of.....cases;

22. In my opinion, the principal sources of danger to life or health in this\*. ...., at the present time, are as follows: .....

My P. O. address is ....., Co.

I hereby certify, that to the best of my knowledge and belief, the statements in the foregoing report are correct.

Dated ....., 1884.

Signed, .....,

Health of the\* ..... of .....

#### DISEASES IN MICHIGAN IN 1883.

A compilation of replies by 24 correspondents to circular 67, relative to diseases in Michigan in 1883, and some conditions coincident therewith, is printed, with replies, on pages 55-78.

#### WEEKLY REPORTS OF DISEASES IN 1883.

A list of observers for the calendar year 1883 is printed on pages 219-221. A compilation of reports, with a study of relations of sickness to climatic conditions is printed on pages 196-250. A copy of the circular (61) used in asking for reports by health officers of villages is printed on page xii. of the Report for 1883.

#### HEALTH BULLETINS.

The weekly reports of diseases received up to Wednesday of the week following the week for which they are made, are compiled on that day, week by week, and a bulletin, based on the compilation, is sent for publication to a large

\* Insert the word "township," "city," or "village."      † This is the term employed in the law. It includes all communicable diseases, whether epidemic, endemic, or contagious.

‡ In filling blanks followed by such words as "deaths," "cases," etc., numbers should be stated if possible, either in words or figures, and "0" should be written where that expresses the truth; for the reason that a blank space indicates that the item has been overlooked, and a dash or an X should not be used in place of a cipher, because the dash is usually employed to indicate that a blank which does not require to be filled with a figure or letter has not been overlooked.

a If not sent, insert the syllable "out."      b If not sent, insert the word "not."  
c Insert the word "greater," "less," or "the same," as the fact may be. If much greater or less, say so.

d Insert "in" or "de" according as the sickness may have increased or decreased.

e Insert the number in figures.

f If there is absolutely no case to report, the blank form for cases need not be sent in as a part of your report, but it is important to fill all the blanks after names of diseases on this form with ciphers, if that expresses the truth, to show that you have no case of each disease.

g After each disease insert the words "the disease was contracted in the city of ..... " or "at the school in ..... " "in a room occupied by persons sick with the same disease ..... (time) since," "by means of clothing worn by patient with the same disease," etc., etc., as the facts may be. In the case of typhoid fever, if the privy was near the well, or within the dwelling, state the facts.

h Insert the words "excessive mortality," "excessive sickness," "general healthfulness," or otherwise express the facts.

i Please state whether any lamp explosion has occurred, and especially mention any injuries to persons thereby.

In the foregoing report, PLEASE FILL ALL BLANKS IN SOME WAY TO SHOW THAT NONE HAVE BEEN OVERLOOKED.

Please answer the questions as they are printed, and in the blanks left for that purpose. Do not change or mark out any of the printed matter. If you wish to communicate any item which will not go in the blank as printed, please write on a separate sheet of paper.

POSTAGE SHOULD BE PREPAID ON THIS REPORT AT THE RATE OF LETTER POSTAGE, WHICH IS TWO CENTS FOR EACH HALF-OUNCE, OR FRACTION THEREOF.

number of newspapers, and to sanitary and medical journals. A telegraphic abstract from the compilation is also sent weekly to a Michigan Press Association. Beginning with the month of August, a monthly health bulletin has been issued immediately after the close of each month for the use of monthly sanitary and medical journals. A reprint of the weekly bulletins is sent monthly to observers of diseases and to the sanitary journals and exchanges, with the view of facilitating studies of the causes of diseases. The following is a copy of the bulletin for the week ending Sept. 6, 1884, including a comparison of the month of August with the same month in previous years.

#### *Health in Michigan.*

Reports to the State Board of Health, Lansing, by observers in different parts of the State, show the diseases which caused most sickness in Michigan during the week ending Sept. 6, 1884, as follows:—

DISEASES, ARRANGED IN ORDER OF GREATEST AREA OF PREVALENCE.	NUMBER OF OBSERVERS HEARD FROM, 48.	
	Percent of observers who reported the disease present.	Percent of observers who reported the disease present.
Diarrhea.....	90	86
Intermittent fever.....	77	81
Neuralgia.....	65	64
Consumption of lungs.....	60	58
Rheumatism.....	54	70
Cholera morbus.....	52	54
Remittent fever.....	48	52
Tonsillitis.....	46	52
Cholera infantum.....	41	44
Bronchitis.....	44	50
Dysentery.....	44	56
Influenza.....	38	32
Typho-malarial fever.....	23	22
Whooping-cough.....	21	26
Erysipelas.....	19	28
Inflammation of bowels.....	19	20
Inflammation of kidney.....	19	24
Typhoid fever (enteric).....	15	16
Scarlet fever.....	13	10
Diphtheria.....	10	16
Inflammation of Brain.....	8	10
Cerebro-spinal meningitis.....	8	4
Membranous croup.....	8	6
Puerperal fever.....	6	8
Pneumonia.....	4	10
Measles.....	4	4

For the week ending Sept. 6, 1884, the reports indicate that tonsillitis increased, and that rheumatism, dysentery, and erysipelas decreased in area of prevalence.

At the State Capitol, the prevailing winds during the week ending Sept. 6, were south, southwest, and west; and compared with the preceding week, the temperature was higher, the absolute humidity and the day ozone more, the relative humidity and the night ozone less.

Compared with the average for the month of August in the six years 1877-1882, erysipelas, rheumatism, and bronchitis were more prevalent, and remittent fever, intermittent fever, dysentery, and cholera morbus, were less prevalent in August 1884.

For the month of August, 1884, compared with the average of corresponding months for the six years, 1879-1884, the temperature was lower, the absolute and the relative humidity and the day ozone were less, and the night ozone more.

Including reports by regular observers and others, diphtheria was reported present during the week ending Sept. 6, and since, at 13 places, namely, Armada, Bloomfield, Detroit, East Saginaw, Flint, Fowlerville, Grand Rapids, Hardy, Ishpeming, Kalamazoo, Mendon, Romeo, Vassar. Scarlet fever at 10 places, Cadillac, Detroit, Dorr, Dowagiac, Fairfield, Grand Rapids, Howard City, Kalamazoo, Swartz Creek, Vicksburg. Measles at Detroit and Whitehall.

HENRY B. BAKER,

*Secretary.*

Lansing, Sept. 10, 1884.

#### NAMES AND ADDRESSES OF HEALTH OFFICERS OF TOWNSHIPS, CITIES AND VILLAGES.

This office endeavors to maintain communication with every local board of health, and, that this may be done, keeps a carefully corrected list of all health officers returned in accordance with requirements of the law. Most of the health officers are appointed soon after the spring elections.

In March, 1884, a circular (71) was sent to supervisors of townships, presidents, and clerks of villages, and mayors and clerks of cities (1,627 persons in all), transmitting a blank form (E or F) for return of the name and post-office



address, and certain other facts respecting persons appointed as health officers for the year 1884-5. The circular is as follows:

[71.]

OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH,  
Lansing, Mich., April, 1884.

*To the Supervisor, as President of the Township Board of Health:*

DEAR SIR:—Your attention is respectfully asked to the general law relative to Boards of Health in this State, as amended by Act 292, Laws of 1881, which amended section 1693 (being section 2 of chapter 46), Compiled Laws of 1871. The amendment is such that the section now applies to all boards of health, whereas before it only named township boards of health, though made to apply to cities and villages by section 1740 as amended in 1879. The section (1693) as amended in 1881 and now in force, is as follows:

(1693.) SEC. 2. Every board of health shall appoint and constantly have a health officer, who shall be a well-educated physician and act as the sanitary adviser and an executive officer of the board: *Provided*: That in townships where it is not practicable to secure the services of a well-educated and suitable physician, the board may appoint the supervisor or some other person as such health officer. The board of health shall establish his salary or other compensation, and shall regulate and audit all fees and charges of persons employed by them in the execution of the health laws and of their own regulations. Within thirty days after the annual township meeting in each year, the board of health shall meet for the transaction of business, and shall appoint or re-appoint a health officer, and shall immediately cause to be transmitted to the Secretary of the State Board of Health, at Lansing, the full name and postoffice address of such health officer, and a statement whether he is a physician, the supervisor, or some other person not a physician. A special meeting of the board may be called by the order of the president or of any two members of said board.

If for any reason a health officer is not appointed immediately, it will then be necessary to appoint one as soon as possible to fill the vacancy; as will also be necessary if the officer appointed does not qualify. Vacancies also occur whenever the incumbent of an office ceases to be an inhabitant of the township, city, or village for which he was elected or appointed an officer. (See section 617, Compiled Laws of Michigan, 1871.) The law requires that every board of health shall constantly have a health officer, and provides for calling special meetings, so that there would seem to be no difficulty in complying with the requirement.

If any change of the health officer occurs, or if his postoffice address is changed, it will facilitate our work if your board will cause a notice of such change to be sent to this office.

In addition to his services as sanitary adviser of your local board of health, it is desirable that your health officer correspond freely with this office concerning subjects connected with the public health in your locality. Any important sanitary experience of your board may, if thus reported, be made useful to other boards of health throughout the State.

The Annual Reports of the State Board of Health have been sent, year by year, to the health officers whose names and addresses have been returned to this office; but when no return of the name and address of the health officer is received no Report is sent, because it is not known to whom to send the Report.

Documents in English, German, and Dutch, on the restriction and prevention of diphtheria, scarlet-fever, and small-pox, have been printed and distributed largely throughout the State, especially wherever any of these diseases have been known to exist. The leaflet containing general directions for the restriction and prevention of contagious diseases has also been translated into French, Swedish, and Danish-Norwegian, and distributed as opportunity has appeared. Copies of any of these documents for distribution by local boards of health can be had on application to the Secretary of the State Board of Health. The application should state in what language the document is desired. The document on the powers and duties of health officers and local boards of health has been revised to include laws passed in 1883, and distributed to officers and members of all such boards. Copies will be sent on application to any township, city, or village officer.

Act No. 137, Laws of 1883, requires every health officer not otherwise instructed by the board by which he was appointed, to act promptly and decisively for the restriction of contagious diseases, immediately when a case of a contagious disease within his jurisdiction comes to his knowledge, without the delay incident to calling the board of health together. In order that the health officer may have no doubt as to what instructions he has received from your board, and as to what his duty is under the law, it is desirable and important that his attention should be called to the law, and that he should be instructed by your board to act promptly, on the outbreak of a contagious disease, in accordance with the provisions of this State law.

It being one duty of the health officer to report to this office immediately on the outbreak of any communicable disease, it is apparent that in case no health officer is appointed, or his name is not returned, there is often no person in the locality to give proper notice to this office, and no person with whom this office can promptly and effectually co-operate in efforts to restrict or prevent diseases which endanger the public health; in such cases we do not know with whom to communicate when we learn of outbreaks of communicable diseases liable to be conveyed to or from your locality.

Herewith please find a blank form and printed envelope for the use of your board in sending to this office the statement of name and postoffice address of your health officer, and whether or not he is a physician, as required by law.

Very respectfully,

HENRY B. BAKER, *Secretary.*

Form E is as follows (form F is similar to E, but adapted for cities and villages; it is printed on page xi. of the Report for 1882):

[Please fill every blank, by words or figures, or as directed in the foot-notes. Do not mark out any printed words.]

[E]  
To the *Secretary of the State Board of Health, Lansing, Mich.:*

SIR—On the ..... day of ....., 188..., the Township Board, being the Board of Health of the township of ....., County of ....., State of Michigan, met for the transaction of business, and .....\*appointed a Health Officer.

The name of the Health Officer of this township is .....  
His postoffice address is ....., County of ....., Michigan.

He† ..... a physician.

He† ..... the Supervisor of this township.

....., Supervisor,  
of the Township of .....

P. O. address: .....  
..... Township Clerk,  
and Clerk of the Board of Health;

P. O. address: .....

This return is made out by § .....  
Dated at ..... this ..... day of ....., 188...

[~~25~~ Postage should be prepaid on this return, at letter rate, 2 cents for each half ounce or fraction thereof.]

A return of a health officer is sometimes received on this blank not fully or properly filled out. In such a case the blank is marked at the points on which further information is desired and again sent to the person who filled it out, for a more complete statement.

In June the circular and blank form were sent again to localities from which no return of a health officer had been received, and again in July to a few localities still delinquent. In August a printed list of the names and addresses of the health officers was published and distributed to local boards for their use. Up to the date of the publication of this list the whole number of health officers returned for 1884 was, in townships, 926; in villages, 164; in cities, 41; only 253 out of 1,391 localities being delinquent. The publication of this list proved useful in several ways, acting as a stimulus to the local boards, enabling them more easily to inform neighboring boards of the presence of dangerous communicable diseases, and securing to this office more prompt and complete returns.

As fast as addresses of health officers for 1884 were received, there were sent to each such officer enough copies of the revised circular on the work of health officers and local boards to supply each member of the board with a copy; one copy of the document on the restriction and prevention of diphtheria (No. 46), a copy of that on the restriction and prevention of small-pox (No. 54), the revised document on the restriction and prevention of scarlet-fever (No. 72), the general leaflet on contagious diseases (No. 47), and a sample sheet of a blank record for a local record of communicable diseases; and after June 13, a blank form [L] for notification to this office of an outbreak of a dangerous communicable disease was also included in the package sent to each health officer. During the year about 40,000 copies of the several documents on the restriction and prevention of certain contagious diseases, have been sent to

\* If re-appointed, write "re-;" if not, draw a line.

† Insert the word "is," or "is not," as the case may be.

‡ It is not essential that more than one of the officers sign this return, but it is desirable to have the name and postoffice address of each given. If either officer writes in the name of the other, this fact should appear on this return, so that the officer making the return may be known.

§ Insert the words "the Clerk," "the Supervisor," "the Clerk and Supervisor," or otherwise state the facts.



local officers and others, for general distribution in this State, and especially for distribution in localities where such diseases were reported present.

### METEOROLOGICAL REPORTS.

A list of meteorological observers for the calendar year 1883, with a statement of what registers were received from each, is printed on page 130. The reports are summarized in an article on The Principal Meteorological Conditions in Michigan in the Year 1883, on pages 129-195. The data is of great value for purposes of studying the causes of diseases. The observations made at the office of the Board, at Lansing, have been summarized weekly, and a copy of the summary has been furnished for publication to the *Lansing Republican*. Reprints from this have been distributed weekly to the meteorological observers, and monthly to observers of diseases, and to the sanitary journals and other exchanges of the office of the Board, in order to facilitate studies on the relations of meteorological conditions to health. The report for the week ending Saturday, October 4, 1884, containing a summary for September, may serve as a sample, and is as follows:

#### *Meteorological Report.*

From observations at 7 A. M., 2 P. M., and 9 P. M. daily, at the office of the State Board of Health, State Capitol, Lansing, Mich., week ending Saturday, October 4, 1884.  
Latitude, 42° 43' 53.11"; longitude, 84° 33' 19.68".

DAY OF WEEK, ETC.	Day of Month.	Temperature, Degrees F.			Barometer, Average Height. (Corr'd for Temp.)	Inches of Rain.	Grains of Vapor in a Cubic foot of Air.	Relative Humidity.	Maximum = 10. Ozone.	
		High- est.*	Low- est.*	Aver- age.					Day.	Night.
Sunday.....	28	73	60	67½	28.741	.25	6.31	83	3	4
Monday.....	29	79	60	69	29.007	0	6.03	77	2	4
Tuesday.....	30	77	58	70½	29.030	0	6.91	84	3	2
Wednesday.....	1	60	54	56½	29.289	2.43	4.73	88	0	4
Thursday.....	2	79	55	66	29.164	.05	6.37	90	2	3
Friday.....	3	85	65	74	29.107	0	5.66	55	1	2
Saturday.....	4	79	63	71½	29.059	.11	7.13	84	2	3
Week <sup>a</sup> .....		85	54	67.95	29.060	2.84	6.17	80	1.86	3.14
Preceding week <sup>b</sup> .....		78	47	63.86	29.006	1.53	4.89	70	3.09	3.43
September.....		93	43	67.99	29.041	2.71	5.30	66	2.83	2.80
Normal <sup>c</sup> .....		91	37	63.70	29.075	3.12	4.85	69	2.95	2.92

\* By registering thermometers read at 7 A. M. for the preceding calendar day.

<sup>a</sup> Week ending October 4.

<sup>b</sup> Preceding week, ending September 27.

<sup>c</sup> Average for corresponding month in the six years 1879-1884.

For WEEK ending October 4, 1884: Range of temperature, 31°; of barometer .664 in.; of ozone 4°; prevailing winds, southwest; average velocity of wind, 9.6 miles per hour; greatest velocity (Sept. 28th), 60 miles per hour.

For MONTH of September, 1884: Highest barometer (13th), 29.488 in.; lowest (24th), 28.612 in.; average velocity of wind, 9.4 miles per hour; greatest velocity (28th), 60 miles per hour; prevailing winds, southwest.

### EXAMINATION OF PUBLIC BUILDINGS.

See pages 18-33 of this Report.

### EXAMINATION OF PLANS FOR PUBLIC BUILDINGS.

A report of examinations for the year ending September 30, 1884, is printed on pages 33-36.

## TYPHOID FEVER.

An outbreak of considerable extent having occurred at Adrian, a special examination was made by Dr. H. F. Lyster, the committee of this Board on epidemic, endemic, and contagious diseases. His report is printed on pages 36-47. Additional information, secured later, is printed on pages 104-106.

## CHOLERA.

Owing to the threatened danger from cholera it was deemed advisable to publish and distribute a document on its prevention and restriction. Accordingly, 12,000 copies were printed and distributed in Michigan. This document is printed on pages 47-51. A document on "Cholera in its relations to Railroads," was also prepared at the request of the Commissioner of Railroads, and was printed and distributed by that department to all railroad officials in Michigan, with an order directing its measures to be carried out. (See pages 51-53.)

## DISEASED ANIMALS AND DISEASED MEAT.

See pages 1-13 of this Report.

## EXAMINATION OF TEXT BOOKS ON PHYSIOLOGY AND HYGIENE FOR USE IN THE PUBLIC SCHOOLS.

For the law requiring such examination, and for a list of the books approved in accordance therewith, see pages 53-55. Much unremunerated time has been given to this subject by members of this Board.

## REGISTRATION OF PHYSICIANS.

A summary of facts gathered from returns by the county clerks to this office is printed on pages 115-119 of this Report.

## POISONOUS CHEESE.

The summary of a large correspondence will be found on pages 122-128.

## BOOKS AND PERIODICALS.

A list of the books and periodicals received by the library of the Board by purchase, exchange, and gift is given in the annual report of property, on the following pages, together with the names and addresses of the donors. The total number of entries in the library, Sept. 30, 1884, is 4,430. This library is at the service of sanitarians throughout the State, and frequent use is made of it by this class of citizens.

## OTHER DISSEMINATION OF INFORMATION.

On receipt of the names and addresses of health officers, there are sent to each: copies of the documents on restriction and prevention of diphtheria, of scarlet fever, and of small-pox, and the general document on restriction and prevention of contagious diseases; also the Circular [64] on work of health officers and local boards of health.

On the first publication of these documents, enough copies have been sent to supply each member of the local board of health. Where no health officer

has been returned, documents have been sent to the president of the board of health for the health officer.

Copies of the appropriate document on restriction and prevention of a disease, in sufficient number to permit a distribution to families in the immediate vicinity of a case of diphtheria, scarlet fever, or small-pox, are sent immediately on receipt of information of the occurrence of one of these diseases in any part of the State, with a request to the health officer, or other local officer addressed, to put them where they will do the most good. Copies of these documents in German or in Dutch are also sent when it is thought that they can be used to advantage. Owing to frequent requests for documents in French, Polish, Swedish, and Danish-Norwegian, translations of a leaflet on contagious diseases (47) have been made into each of these languages; and copies are sent to local boards when so requested. The documents on the restriction and prevention of diphtheria and of scarlet fever have also been revised and a new edition printed.

It is believed that the people are more likely to read documents on the communicable diseases if they are distributed when there is such sickness in the vicinity. Numerous requests have also been received from other local officers, from teachers, newspapers, etc., for documents relating to these diseases, and in a number of cases many copies have been used by teachers of physiology and hygiene in their classes in the public schools.

Every effort has been made to disseminate a knowledge of the nature of contagious diseases and the danger therefrom, and the results have been in the main highly gratifying. Some account of this branch of the work of this office may be seen in an article on The Communicable Diseases in Michigan, commencing on page 251.

The Annual Report of this Board for the year 1883 has been distributed to all health officers whose names have been reported to this office, to presidents and clerks of city and village boards of health, and to many other officers and citizens interested in public-health work. Abstracts of the quarterly meetings of the Board have also been prepared for the press.

The correspondence of the office with local health authorities, and with others on sanitary subjects has been large, those communications copied covering 2,747 letter book pages, and not including all postals, of which a large number have been sent out.

A compilation (123 pages) of the Public-Health Laws of Michigan in force Sept. 8, 1883, has been prepared in this office and published, and a copy has been sent to each of the correspondents of this Board, and to every health officer in the State, a class of persons who do not receive the session laws. Where no health officer was appointed, a copy was sent to the president of each such board of health.

## REPORT OF THE SECRETARY RELATIVE TO PROPERTY, ETC., FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1884.

*To the President and Members of the Michigan State Board of Health:*

GENTLEMEN. In compliance with section 5 of article II. of the by laws of this Board, the following report of the "nature and amount of property belonging to the Board, which has been received, issued, expended, and destroyed since the last report, and of the property remaining on hand, and also in whose care each item of property is entrusted," is respectfully submitted.

For an account of the instruments and articles of a similar nature, which were on hand at the time of making the last reports, you are respectfully referred to pages xii.-xv. of the Report for 1875, xxvii.-xxxi. for 1876, xl.-liv. for 1877, xxxv.-xlviii. for 1878, xix.-xliii. for 1879, xxi.-xxxvi. for

1880, xviii.—xxxii. for 1881, xv.—xxvi. for 1882, and xvi.—xxviii for 1883. Since that time articles of this class have been purchased as follows:

Two overflow tubes for rain gauges.  
One psychrometer.  
Four psychrometer thermometers.  
Six sets registering thermometers.  
Six cups for psychrometer.  
One rainband spectroscope.  
One R. & J. Beck's No. 33 international binocular microscope, stand, and accessories.  
Two electrotype plates of French leaflet on contagious diseases.  
Two electrotype plates of Swedish leaflet on contagious diseases.  
Two electrotype plates of Danish-Norwegian leaflet on contagious diseases.  
Two electrotype plates of Polish leaflet on communicable diseases.  
Three letter books.  
Fifty mounted slides of bacteria and of trichinæ.

Three improved copy holders.  
One dozen memorandum books.  
One half dozen steel erasers.  
One pound of pencil rubber.  
One-half dozen duplex letter clips.  
Twenty-five pamphlet cases.  
One hundred ozone scales.  
Twenty indexes and twenty receiving cases for Brown's letter file.  
Twenty-five photo engraved plates meteorological conditions in Michigan in 1882.  
One photo engraved plate—deaths by counties in Michigan from diphtheria.  
Six photo engraved plates—jacketed stoves and other devices for securing ventilation.  
Five photo-engraved plates—diseases, plans of buildings, etc.

### Meteorological instruments have been entrusted to observers as follows :

**PSYCHROMETER**, set of registering thermometers, rain gauge with overflow tube, transferred by C. E. Swift to Marcus H. Norman, Lexington. The rain gauge transferred by Mr. Swift was the one returned by James S. Reeves, M. D.

One maximum registering thermometer, one cup for psychrometer, one rain gauge, board, clips and cup for psychrometer, two thermometers for psychrometer (returned by J. S. Reeves, M. D.), to G. G. Gordon, M. D., Swartz Creek.

One set registering thermometers to A. H. Boies, Hudson.

One barometer, board, clips, and cup for psychrometer, one set registering thermometers. (returned by J. S. Reeves, M. D.)

Two thermometers for psychrometer, one rain gauge, to Arthur Beebe, Manistique.

One maximum registering thermometer (to replace one broken) to E. S. Richardson, Reed City.

Two maximum registering thermometers (one broken while in use), barometer, psychrometer set of registering thermometers, rain gauge with overflow tube, transferred by J. E. Fair to D. W. Mitchell, M. D., Harrisville.

One minimum registering thermometer to Rev. J. Pierson, D. D., Ionia.

One minimum registering thermometer (to replace an imperfect one, and which was broken in this office while attempting to adjust), to C. W. Shepard, M. D., Mendon.

One maximum registering thermometer to J. H. Kellogg, M. D., Battle Creek.

One cup to replace one spoiled on psychrometer at office Secretary State Board of Health, one set registering thermometers, and one psychrometer placed in new shelter for instruments in Capitol yard.

Two measuring sticks for rain gauge.

Books and other publications have been received and placed in the library of the Board (during the year ending September 30, 1884), as follows:

#### BY PURCHASE:

The Collective Investigation of Diphtheria.—Mulheron.

Trans. of London Epidemiological Soc., new series, Vol. I, II.

Analysis and Adulteration of Foods. Parts I and II.

Observations on Construction of Healthy Dwellings.—Galton.

Hand Book of House Sanitation.—Denton.

Sewage Disposal.—Robinson.

Trans. of Prov. Med. and Surg. Ass'n, Vols. VIII and X.

Encyclopedia Britannica, Vol. XVI.

Dangers to Health.—Teale.

Insanity: Its Causes and Prevention.—Stearns.

Practical Pathology.—Woodhead.

Animal Plagues.—Fleming.

Tribune Almanac and Political Register, 1884.

The Human Body.—Martin.

Photo-Micrographs and How to Make Them.—Sternberg.

Memoranda on Poisons.—Tanner.

Enteric Fever.—Welch.

Manual of Practical Hygiene.—Parkes.

Steam Heating.—Briggs.

Fallacies: A view of Logic.—Sidgwick.

Sepulture.—Stephen Wicks.

Hints on Drainage and Sewerage of Dwellings.—Gerhard.

Reports by Surg.-Gen. Hunter on Cholera Epidemic in Egypt.

Suicide.—Morselli.

The Field of Disease: A Book of Preventive Medicine.—Richardson.



What is Malaria?—Oldham.

Hospital Management.—J. L. Clifford Smith.

Mittheilungen aus dem Kaiserlichen Gesundheitsamte Herausgegeben von Dr. Struck, Geheimer, Ober-Regierungsrathe, Director des Kaiserl. Gesundheitsamtes. Zweiter Band mit 13 Chromolithographischen Tafeln und 13 Holzschnitten.

German-English Dictionary of Words and Terms used in Medicine and its Cognate Sciences.—Fancourt Barnes.

Steam Heating for Buildings.—Baldwin.

Sound Bodies for Our Boys and Girls.—Blaikie.

Medical German: Manual for Physicians.—Deutsch.

Eine neue Theorie über Erzielung von Immunität gegen Infectiouskrankheiten.—Buchner.

Die aetiologische Therapie und Prophylaxis der Lungentuberculose.—Buchner.

Boden und Grundwasser in ihren Beziehungen zu Cholera und Typhus.—Pettenkofer.

Pathological Anatomy and Pathogenesis, Parts I and II.—Ziegler, Trans. by Macalister.

Principles of Ventilation and Heating.—Billings.

History of Asiatic Cholera.—Macnamara.

Congres International D'Hygiene at de Demographic—5e Session La Haye 21-27 Aout 1884.

Programme des Travaux. Seances generales.

Medical Record, New York.

Lancet, Detroit.

Official Postal Guide.

Scientific American and Supplement.

Sanitary Engineer, New York.

American Journal of the Medical Sciences.

Medical Times, Philadelphia.

Popular Science Monthly.

Lancet, London.

Nature, London.

British Medical Journal, London.

Practitioner, London, Eng.

Sanitary Record, London, Eng.

Journal of Chemistry, Boston.

Comptes Rendus hebdomadaires des seances de l'Academie des Sciences, Paris.

Revue d'Hygiene, Paris.

Sanitary Journal, Glasgow, Scotland.

Archiv für Hygiene, Munich.

American Meteorological Journal, Detroit.

*Received in exchange for Publications of this Board the following Periodicals (in some instances incomplete volumes):—*

Annals of Hygiene, Philadelphia.

American Inventor, Cincinnati.

American Chemical Review, Chicago.

American Exchange and Review, Philadelphia.

American Monthly Microscopical Journal, New York.

American Observer and Medical Monthly, Detroit.

Medical and Surgical Journal, Buffalo.

Bulletin de l'Academie Royale de Medicine de Belgique.

Bulletin Hebdomadaire de Statistique Demographique et Medicale, Havre.

Bulletin Mensuel du Bureau de Demographie, Marseilles.

Canada Lancet, Toronto.

Canada Med. and Surg. Journal.

Canadian Practitioner, Toronto.

Chicago Med. Journal and Examiner.

Cincinnati Lancet and Clinic.

College and Clinical Record, Philadelphia.

Columbus Medical Journal, Columbus, O.

Crop Prospects, Illinois.

Centralblatt für allgemeine Gesundheit.

Druggist's Circular, New York.

Exhibition Record, London, Eng.

Ephemeris, Squibbs, Brooklyn, N. Y.

Fort Wayne Journal of Med. Science.

Good Health, Battle Creek.

Herald of Health, New York.

Hydraulic and Sanitary Plumber, New York.

Hygiene Pratique, Paris.

Indicator, Detroit.

Journal of Am. Med. Ass'n, Chicago.

Journal d'Hygiene, Paris.

Journal Franklin Institute.

Louisiana State Weather Service Report.

Leonard's Illns. Medical Journal.

Medical News, Louisville, Ky.

Microscopical Bulletin, Philadelphia.

Manadsofversigt af Væderleken i Sverige.

Manufacturer and Builder.

Maryland Medical Journal, Baltimore.

Medical Age, Detroit.

Medical Bulletin, Philadelphia.

Medical Chronicle, Baltimore.

Medical Counselor, Grand Rapids.

Medical News, Philadelphia.

Metal Worker, New York.

Michigan Crop Report.

Naradno Zdravly, Belgrade, Servia.

New York Medical Abstract.

New York Medical Journal.

North Carolina Med. Jour., Wilmington.

Northwestern Lancet, St. Paul, Minn.

Ohio Meteorological Bureau.

Ontario Weekly Health Bulletin, Toronto.

Philadelphia Medical Times.

Physician and Surgeon, Ann Arbor.

Popular Science News and Boston Journal of Chemistry.

Pharmaceutische Rundschau, New York.

Quarterly Return of Marriages, Births, and Deaths in Ireland.

Sanitarian, New York.

Sanitary Journal, Toronto.

Sanitary News, Chicago.

Scientific Educator, Ashville, Ala.

Texas Courier-Record of Medicine, Fort Worth, Texas.

Therapeutic Gazette, Detroit.

Vaccination Inquirer, London.

Veröffentlichungen des Kaiserlich Deutschen Gesund.

Veröffentlich des Statistischen Amtes der Stadt Berlin.

Weather Review, Monthly, Washington.

Weekly Drug News, New York.

Weekly Medical Review, Chicago.  
 Weekly Return of Births and Deaths in Dublin.  
 Salford Health Bulletin.  
 Tennessee Crop Report.

Alabama Weather Service.  
 Manitoba Crop Bulletin.  
 Georgia Crop Report.

BY GIFT, EXCHANGE, ETC. (*Names and addresses of donors being printed in italics*):—

- Abbott, Dr. S. W., Boston, Mass.:*—  
 Suggestions of Mass. Board of Health for Preventing Spread of Diphtheria.  
 41st Rep. relating to Registry and Return of Births, Marriages, and Deaths in Mass., 1882, and returns of Libels for Divorce for 1879-1882.  
 4th Annual Report of Mass. Board of Health, Lunacy, and Charity, 1883.
- Ades & Co., Fred., New York:*—  
 Catalogue and price list of Specialties in Plumbing and Sanitary goods.
- Adams, J. W., Carmel, N. Y.:*—  
 Trans. of N. Y. Medical Society, 1883.
- Allen, Jno. K., Chicago, Ill.:*—  
 Soap and Water.
- Alexander, C. E., H. B., Kansas City, Mo.:*—  
 Report of Comptroller, City Eng., and other officers of Kansas City, Mo., 1882.
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BY JOHN H. KELLOGG, M. D.

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 N. Y. Med. Abstract, April, 1883.  
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- Trans. Mich. Med. Society, 1874. No. 73.  
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BY PROF. T. J. BURRILL, CHAMPAIGN, ILL.

- New York Med. Abstract, July 1, 1884.

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- Scientific American, July 5, 1879.

BY C. C. YEMENS, M. D.

- Report on Plans for Securing Records of Deaths. Harris. No. 1703.  
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BY HON. W. W. ROOT, M. D.

- Mayor's Address, Aurora, Ill., 1879. No. 1114.  
 Sanitary Work in Lansing, Mich. No. 2031.

## WEEKLY OR MONTHLY MORTALITY STATEMENTS.

These have been received during the past year from health officers, registrars, officers of boards of health, or of cities in the United States or foreign countries, as follows:—

- Abbott, M. D., S. W., Health Officer, Department of Health, State House, Boston, Mass.  
 Ashmun, M. D., G. C., Health Officer, Cleveland, Ohio.  
 Atwater, M. D., H. H., and John B. Wheeler, M. D., Health Officers, Burlington, Vt.  
 Baldwin, M. D., A. S., Chair. Com. on Vital Statistics, Board of Health, Jacksonville, Fla.  
 Beduin, Dr. L. Scheltema, Secretaris, Amsterdam, Holland.  
 Bestuur, Von Gezondheid, Amsterdam, Netherlands.  
 Bidentkof, Dr., chef del 'Administration Sanitaire, Christiana, Norway.  
 Boyd, Geo., Registrar Vital Statistics, Patterson, N. J.  
 Boyd, M. D., S. B., Secretary Board of Health, Knoxville, Tenn.  
 Brewer, M. D., Charles, Vineland, N. J.  
 Buck, M. D., E. W., Health Officer and City Physician, Oakland, Cal.  
 Bureau D'Hygiene, Havre, France.  
 Burrows, Acton, Deputy Minister Agric., Statistics and Health, Winnipeg, Manitoba.  
 Bureau de Demographie et de la Statistique Medical de la Ville, Marseilles, France.  
 Cabell, M. D., J. G., Prest. Board of Health, Richmond, Va.  
 Carter, A. Robert, Sec. City Board of Health, Baltimore, Md.  
 Canniff, Dr. Wm. O., Medical Health Officer, Toronto, Ont.  
 Cargill, H. N., Clerk of Board of Health, Grand Rapids, Mich.  
 Chamberlain, Dr. C. W., Sec. State Board of Health, Hartford, Conn.  
 ———, M. D., ———, Health Officer, Nashville, Tenn.  
 Cocchi, A. Il Direttore, Dell' Ufficio di Statistica e Stato Della citer di Roma, Rome, Italy.  
 Conn, M. D., Granville, P., Health Officer, Concord, N. H.  
 Day, M. D., Walter De F., Sanitary Supt. and Registrar, N. Y. City.  
 Det. Kgl. Sundheds Collegium, Copenhagen, Denmark.  
 Edwards, M. D., Tom O., Health Officer, Wheeling, W. Va.  
 Elder, Thos. S., Sec., No. Aux San. Asso., New Orleans, La.  
 Fairchild, M. D., M. B. Physician to Board of Health, Syracuse, N. Y.  
 Foster, M. D., Eugene, Prest. Board of Health, Augusta, Ga.  
 Fournier, M. D., E. H., Health Officer, Mobile, Ala.  
 Fraser, M. D., E. B., Registrar, Wilmington, Del.  
 Furnis, M. D., John P., Selma, Ala.  
 Galt, M. D., James D., Health Officer, Norfolk, Va.  
 Gleason, M. D., M. K., Registrar Vital Statistics, and De Wolf, M. D., O. C., Health Officer, and McVicker, Brock L., Sec. City Board of Health, Chicago, Ill.  
 Goldsmith, M., D. W. T., Pres't Board of Health, Atlanta, Ga.  
 Gordon, M. D., E. W., Pres't Board of Health, Petersburg, Va.  
 Grimshaw, M. D., Thomas W., Registrar-General, Dublin, Ireland.  
 Hargis, M. D., R. B. S., Health Officer, Pensacola, Fla.  
 Health Officer, Lowell, Mass.  
 Hatch, M. D., F. W., Sec. State Board of Health, Sacramento, Ca..  
 Horlbeck, M. D., H. B., City Registrar, Charleston, S. C.  
 Hoyt, Henry F., Health Officer, St. Paul, Minn.  
 Hudson, M. D., H. S., Registrar Vital Statistics, Selma, Ala.  
 Hunt, M. D., James G., Health Officer, Utica, N. Y.  
 Hunter, W. H., City Sexton; Watkins, R. N., City Sexton, Lansing, Mich.  
 Iddings, M. D., A. H., Health Officer, Dayton, O.  
 Jones, M. D., J. S., Pres't, and Herrick, M. D., S. S., Sec. State Board of Health, New Orleans, La.  
 Knight, M. D., A. W., Health Officer, Jacksonville, Fla.  
 LaRocque, M. D., A. B., Medical Health Officer, Montreal, P. Q.  
 Lindley, M. D., Walter, Health Officer, Los Angeles, Cal.  
 Lindsley, M. D., C. A., Health Officer, New Haven, Conn.  
 Luedeking, Dr. Robert, Sec. Board of Health, St. Louis, Mo.  
 Martin, M. D., R., Commissioner of Health, Milwaukee, Wis.  
 Mattocks, M. D., Brewer, Pres't Board of Health, St. Paul, Minn.  
 McLeod, A. M., M. D., D. K., Surgeon Major, Health Officer, and O'Brien, A. M., M. D., Health Officer, Calcutta, East India.  
 Means, M. D., T. A., Health Officer and Registrar, Montgomery, Ala.  
 Mears, M. D., J. L., Health Officer, San Francisco, Cal.  
 Ministerio de la Gobernacion! Direccion General de beneficencia y Sanidad, Madrid, Spain.  
 Mitchell, M. D., Chas., Health Officer and Registrar, Nashville, Tenn.  
 Nagle, M. D., John T., Deputy Registrar of Records, N. Y. City.

Nash, Dr. Herbert M., Pres't Board of Health, Norfolk, Va.  
 Park, M. D., J. P., Knoxville, Tenn.  
 Phelps, M. D., W. C., Health Officer, Buffalo, N. Y.  
 Riggs, Dr. B. H., Registrar, Selma, Ala.  
 Rowland, C. W., Health Officer, Cincinnati, Ohio.  
 Salisbury, M. D., A. H., Health Officer, Minneapolis, Minn.  
 Scales, M. D., T. S., Health Officer, Mobile, Ala.  
 Selfridge, Gen. James L., Health Officer, Philadelphia, Pa.  
 Sheehan, M. D., Wm. F., Health Officer, Rochester, N. Y.  
 Smith, M. D., Wm. M., Health Officer of the Port, N. Y. City.  
 Snow, M. D., Edwin M., Supt. of Health, Providence, R. I.  
 Stadts Gesundheitsamt, Bremen, Germany.  
 Stadts Gesundheitsamt, Hamburg, Germany.  
 Statistisches Amt der Stadt Berlin, Berlin, Germany.  
 Stearns, M. D., I. H., Health Officer, Milwaukee, Wis.  
 Tatham, M. D., John, Medical Officer of Health, Salford, Eng.  
 Thornton, M. D., G. B., Pres't, and Purnell, M. D., J. H., Sec. Board of Health, Memphis, Tenn.  
 Townshend, M. D., Smith, Health Officer and Registrar, Washington, D. C.  
 Trembley, M. D., J. B., Oakland, Cal.  
 VanDeman, M. D., J. H., Registrar Vital Statistics, Chattanooga, Tenn.  
 VanPelt, M. D., Chas. L., Health Officer, Toledo, Ohio.  
 Wellings, M. D., J. H., and McMillan, M. D., Alex., Health Officers, Lansing, Mich.  
 Wheeler, M. D., John B., Health Officer, Burlington, Vt.  
 Wiedman, M. D., W. M., Pres't Board of Health, Reading, Pa.  
 Wight, M. D., O. W., Health Officer, Detroit, Mich.  
 Wyckoff, M. D., R. M., Registrar of Records, Brooklyn, N. Y.

Distributions of the various documents on contagious diseases have been made during the year to the amount of many thousand copies, great numbers of these having been sent for distribution in localities where these diseases were present.

The following circulars on Communicable Diseases, and on the work of health officers, are now on hand:—

## IN ENGLISH.

Circular No.	Name of Document.	Copies.
No. 47.	Contagious Diseases .....	14,800
No. 45.	Prevention and Restriction of Diphtheria (issue of 1881).....	160
No. 76.	Prevention and Restriction of Diphtheria (issue of 1884).....	19,500
No. 73.	Prevention and Restriction of Scarlet Fever (issue of 1884).....	17,500
No. 51.	Restriction and Prevention of Small-Pox .....	11,920
No. 75.	Prevention and Restriction of Cholera (issue of 1884).....	80
No. 64.	Work of Health Officers (old issue).....	200
No. 64.	Work of Health Officers (issue of 1834).....	1,700

## IN FOREIGN LANGUAGES.

No. 45.	Restriction and Prevention of Diphtheria (German).....	4,338
No. 45.	Restriction and Prevention of Diphtheria (Dutch).....	1,537
No. 46.	Restriction and Prevention of Scarlet Fever (German).....	3,918
No. 46.	Restriction and Prevention of Scarlet Fever (Dutch).....	4,320
No. 54.	Prevention and Restriction of Small-Pox (German).....	4,615
No. 54.	Prevention and Restriction of Small-Pox (Dutch).....	4,690
No. 68.	Leaflet on Contagious Diseases (French).....	1,800
No. 69.	Leaflet on Contagious Diseases (Danish-Norwegian).....	2,000
No. 70.	Leaflet on Contagious Diseases (Swedish).....	2,000
No. 73.	Leaflet on Contagious Diseases (Polish).....	2,500

The following table shows the amount and kind of hard paper there was on hand at the time of making the last report, the amount purchased during the year, the amount used, and the amount now on hand:—

KIND OF PAPER.	On Hand at Last Report.		Purchased Since Last Report.		Used During the Year.		On Hand Now.	
	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.
Medium.....		30				12		18
Folio-post.....	12	50	26		10	310	18	220
Demy.....		400	1			176	1	224
Crown.....	1		16		8	226	8	254
Cover paper.....		400	7		4	400	3	
Manilla wrapping-paper.....	3	120			1	395	1	203
Blotting-paper.....		125				18		107
Foolscap.....		100	2			100	2	
Legal cap.....	1	178	1			178	2	
Book-paper.....			5		1	240	3	240
Linen (type-writer) paper.....				500		200		300
Folio copying-paper.....				48		28		50
Carbon paper.....				12				12
Post office paper.....	1	320					1	320

The hard paper has been used in making blank books for use in the office, circulars, announcements and programs for sanitary conventions, printed letters, writing paper, etc. The cover paper has been used for covers to reprints and record-books, for weekly reports of diseases, and wrappers for packages of ozone test-paper.

At the time of making the last report there were about 3,250 sheets of letter, half-letter, and note paper on hand. Since that time 14,360 sheets of letter, half-letter, note, and half-note have been made from folio-post paper. There are now on hand about 4,244 sheets of letter and half-letter. There have been issued to members of the board 1,975 sheets of letter, half-letter, and note paper. This shows about 11,391 sheets of letter, half-letter, note, and half-note to have been used in this office.

There were about 94,356 envelopes on hand when the last report was made; 69,550 have been purchased since, making a total of 163,906. There are on hand now of printed envelopes, 50,158; of blank envelopes, 73,200; making a total of 123,358; 500 have been issued to members of the board, and 40,048 have been used in conducting the business of the office.

There was on hand at the time of making the last report \$71.46 in postage stamps, postal cards, and postal money. Vouchers for postage and box-rent have been allowed during the year to the amount of \$906. There is now on hand in postage stamps, \$61.06, unused postal cards, \$9.75, and postal money, \$110.04, a total of \$179.85. The cost of postage during the year has been \$739.61. Some of the principal items of postage have been as follows:—

General distribution of the Report of the Board for 1882.....	\$19 09
General distribution of the Report of the Board for 1883.....	57 14
General distribution of the Public Health Laws, Proceedings of the Pontiac, Reed City, and Ionia Sanitary Conventions, and of other documents and circulars.....	279 77
Sending weekly meteorological, and monthly mortality statements, and weekly bulletins..	81 32
Sending ozone test paper, blank registers, and other meteorological material (supplied at regular intervals) and return postage.....	16 45
Sending blanks (at regular intervals) for weekly reports of diseases, and return postage....	12 04
Sending announcements and programmes for sanitary conventions.....	27 23
Regular and special correspondence of the office, and all other postage.....	303 57
	<u>\$799 61</u>

Thus far this report has given exactly or approximately, the kind and amount of property received, on hand, and disposed of by this office during the fiscal year ending Sept. 30, 1884. But in order to show exactly how much has been allowed by this board to be expended from the State treasury for all property and all other expenses during this time specified, the following classified statement of expenditures, as shown by all vouchers allowed by this board during the fiscal year is here presented. It includes vouchers number 894 to 1052 inclusive:—



TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE BOARD OF  
HEALTH, AS PER VOUCHERS NUMBER 894 TO 1052 INCLUSIVE, ALLOWED  
DURING THE FISCAL YEAR ENDING SEPTEMBER 30, 1884.

Chemical analyses.....	\$25 50
Engraving, drawing, etc.....	33 50
Expenses of members { Attending meetings.....	255 56
{ Other official.....	278 12
Instruments and books.....	791 37
Paper, stationery, etc.....	490 98
Postage { Office.....	902 00
{ Members.....	4 00
Printing and binding.....	704 47
Secretary.....	2,000 00
Special investigations.....	39 35
Miscellaneous.....	222 69
Total.....	\$5,747 54

Respectfully submitted,

HENRY B. BAKER. *Secretary.*

Having compared the secretary's annual report of property received, issued, expended, and destroyed during the fiscal year ending Sept. 30, 1884, with the property book and the record of proceedings, and having examined the foregoing account of expenditures, and compared the same with the books in the Auditor General's office, I find the same to be correct.

Lansing, Mich., Jan. 13, 1885.

ARTHUR HAZLEWOOD,  
*Com. on Finances of the Board*

EXPENDITURES BY THE STATE BOARD OF HEALTH IN CALENDAR YEAR 1884.

The appropriation for the board is made for the calendar year, and cannot exceed six thousand dollars (\$6,000). The following is a statement of expenditures by the board during the calendar year 1884:

CLASSIFIED STATEMENT OF EXPENDITURES BY THE BOARD DURING THE CALENDAR YEAR 1884.

Chemical analyses.....	\$25 00
Engraving, drawing, etc.....	184 00
Expenses of members { Attending meetings.....	194 54
{ Other official.....	472 09
Instruments and books.....	394 55
Paper, stationery, etc.....	342 85
Postage { Office.....	1,100 00
{ Members.....	1 00
Printing and binding.....	796 45
Secretary.....	2,041 66
Special investigations.....	189 35
Miscellaneous.....	268 32
Total.....	\$5,999 81

# ABSTRACTS AND BRIEF ACCOUNTS OF THE PROCEEDINGS AT MEETINGS OF THE STATE BOARD OF HEALTH DURING THE YEAR ENDING SEPTEMBER 30, 1884.

REGULAR QUARTERLY MEETING AT LANSING, OCTOBER 9, 1883.

Present: Drs. Kellogg, Hazlewood, Tyler, and Baker.

The secretary presented his annual report of property, which was referred to the committee on finances.

An invitation from Dr. Whelan, on behalf of the common council, to hold a sanitary convention at Hillsdale, was accepted, and a communication from Rev. J. Pierson, relative to holding a sanitary convention at Ionia, was read. The committee on sanitary conventions was instructed to make arrangements for holding a sanitary convention at Ionia.

A communication from Hon. C. A. Gower, calling for the examination of plans for a new building as soon as practicable after October 23, 1883, was read by the secretary. The Board voted that when this meeting adjourned, it should be to meet at the State Reform School to examine plans, at such time as should be found practicable by the secretary.

## *Afternoon Session.*

A communication from Dr. Adolphus Isler, of Calumet, L. S., Michigan, relative to translating the documents of this Board into the Scandinavian language, so that they can be read by miners and others in that locality, among whom scarlet fever and diphtheria occur, was read. The secretary was instructed to have a revised copy of the document No. 47—Contagious Diseases—General Rules for their Prevention—translated into the Swedish, French, and Polish languages, and to print an edition of three thousand copies in each such language. The secretary was authorized to send out to regular correspondents the blank for reports, as in former years, providing for the return of facts respecting sickness in Michigan in 1883.

The secretary was authorized to print and send out the blank forms for reports of health officers and clerks of local boards of health substantially the same as has heretofore been done.

The secretary was instructed to procure from county clerks the names, addresses, etc., of medical practitioners, at as little expense to the Board as possible.

The secretary was directed to edit and publish the correspondence relative to communicable diseases in Michigan.

A petition from citizens of Morley, relative to saw-dust and refuse thrown into a stream in that locality, was presented by the secretary. [See pages xi-xlii of the Report for 1883.]

The secretary presented a résumé of work by other boards of health, in which he stated that the Boston board of health had added measles to the list of dangerous contagious diseases, and that that board will, if requested, personally superintend the disinfection of premises where contagious diseases have occurred. This subject was discussed by the Board.

The secretary was authorized to purchase a rain-band spectroscope for use in meteorological studies.

Drs. Baker and Hazlewood were appointed a special committee to examine and report upon text-books on physiology and hygiene—effects of alcohol, etc., under the law.—Sec. 15 of chapter III., as amended by Act No. 93, Laws of 1883.

The secretary was instructed to compile the laws of Michigan relating to the public health, and to publish the compilation as a supplement to the Annual Report.

Dr. Kellogg, for the special committee on present knowledge concerning diphtheria, reported that about one year ago the committee prepared a circular and sent out about one thousand copies. To this circular about fifty replies have been received, some of them being very valuable. He had prepared a summary, and conclusions which he presented in manuscript. The report was ordered published in the Annual Report. [See pages 44–67 of the Report for 1883.]

#### SPECIAL MEETING AT LANSING, OCTOBER 29, 1883.

Present: Hon. John Avery, M. D., president; and Drs. Kellogg, Vaughan, Tyler, and Baker.

The first part of the meeting was held at the State Reform School, and the second in the office of the Board.

L. D. Grosvenor, architect, exhibited and explained the plans for the proposed new wing to the main building of the State Reform School.

After considerable discussion of the plans, the secretary was authorized to prepare, from his notes, a statement of the results of the examination. [The statement can be found on pages 33–35 of this Report.]

#### SPECIAL MEETING AT DETROIT, NOV. 13, 14, AND 15, 1883.

This meeting was held in connection with the meeting at the same time of the American Public Health Association, before which the president of the Board, Hon. John Avery, of Greenville, made an address, and to the interest of which all of the members of the Board contributed as much as possible.

#### SPECIAL MEETING AT IONIA, MICH., DEC. 13 AND 14, 1883.

Present: Hon. John Avery, M. D., president; and Drs. Lyster, Kellogg, Hazlewood, and Baker.

This meeting was held in connection with the Sanitary Convention at Ionia, held under the auspices of the Board.

During their attendance in Ionia, several members of the Board inspected the site of the proposed new building for the criminal insane adjoining the State House of Correction; also the preliminary plans for the building. [Another examination of the plans was made at a subsequent meeting, in Detroit, and the report as then made is given on pages 35–36 of this Report.]

The president and some of the members of this Board also participated at this time in a joint meeting with the president and some of the members of the State Board of Corrections and Charities, at which meeting there were discussed questions concerning the best methods whereby these two State Boards may work for the better sanitary condition of jails, poor-houses, asylums, etc., under the charge of the State Board of Corrections and Charities. As one result of the conference, the State Board of Corrections and Charities requested the State Board of Health to make certain inspections. [See resolutions on page 18 of this Report.]

REGULAR QUARTERLY MEETING AT LANSING, JANUARY 8, 1884.

Present: Hon. John Avery, M. D., president; Drs. Kellogg, Vaughan, Tyler, and Baker.

The secretary read a résumé of the recent work by other State boards of health. He also read a report of the main items of work in the office of this Board.

A letter from Arthur Hazlewood, M. D., member of the committee of this Board on examination of text-books on the effects of alcohol, etc., for the use of schools, was read by the secretary, who also presented an opinion by the Attorney General of Michigan relative to the proper construction of the law requiring the examination, by the State Boards of Education and of Health, of text-books on the effects of alcohol, etc. [The opinion is printed on pages 53-54 of this Report.]

Dr. Baker, as chairman of the committee to examine the text-books and report to this Board, reported that four books had been presented and examined, namely: "Dalton's Physiology;" "Elements of Physiology and Hygiene," by R. T. Brown; "Lessons on the Human Body," by Orestes M. Brands, and "Alcohol—Its Effects on Body and Mind," by Eli F. Brown. There was much discussion of the subject, but no formal action was taken at this time.

Dr. Avery's report concerning the ventilation of workshops at the State House of Correction at Ionia, September 7, 1883, was ordered to be printed in the Annual Report for 1883. [See page 29 of that Report.]

Dr. Hazlewood's report of his attendance at the Sanitary Convention at London, Ont., was read by the secretary. It was accepted with thanks to the author, and ordered to be printed in the Annual Report for 1884. [See pages 14-15 of this Report.]

Dr. Baker made an additional report of attendance at the same convention, speaking more particularly about his visit to the Asylum for the Insane, near London, especially in regard to the ventilation in the main building.

Dr. Hazlewood's report of attendance of the Conference of County Agents and Convention of the State Board of Charities, at East Saginaw, was read by the secretary.

### *Afternoon Session.*

A communication from Hon. Witter J. Baxter, Secretary of the Board of State Charities, conveying the request of that Board for the examination by this Board, or by a committee of this Board, into the sanitary condition of the jails and other public buildings in several counties in this State, was read by the secretary. It was voted to comply with the request, and to invite a prominent citizen at each place where an examination should be made, to assist the committee of this Board in the examination. Committees were appointed as follows: To visit and examine the Jackson county jail, Drs. V. C. Vaughan and J. H. Kellogg; the Washtenaw county jail, Drs. J. H. Kellogg and V. C. Vaughan; the Van Buren county jail, Drs. A. Hazlewood and J. H. Kellogg, with Dr. Henry B. Baker as alternate, in case of the inability of one of the others to attend; the poor house, and asylum in connection with the same, in Wayne county, Drs. Henry F. Lyster and C. V. Tyler. On motion, Dr. John Avery, the president of the Board, and Dr. Arthur Hazlewood, were appointed a committee to visit and examine the Barry county jail.

By invitation, H. R. Gass, Superintendent of Public Instruction, and B. W.



Jenks, a member of the State Board of Education, took seats in the meeting, and a conference was held in regard to text-books relative to the effects of alcohol.

A communication from the Attorney General of Michigan, replying to the question whether text-books on general hygiene or physiology must be examined by this Board, was read by the secretary. [See pages 53-54 of this Report.]

It was then voted that the present committee on text-books be continued and instructed to confer with a like committee on the part of the State Board of Education, and report at the next meeting of the Board in April. Dr. Vaughan was added to the committee.

The secretary presented considerable correspondence relative to a case of supposed leprosy at Menominee, Mich. The secretary was directed to correspond with the local health officer, and request him to report any new case which might arise. He was also to ask that the leper be advised to use care as to his association with other persons, and to be warned of the possibility of his communicating the disease.

The secretary reported considerable correspondence with local health authorities respecting the introduction into this State, by way of Chicago, of three car loads of beef cattle sick with *actinomyces*, sometimes called "swell-head." [See pages 6-9 of this Report.]

The secretary reported a meeting which had been held during the meeting in Detroit of the American Public Health Association, of secretaries and other representatives of some of the State Boards of Health. Concerted action by the several State Boards of Health was discussed at that meeting, and committees were appointed to place the subject before the several State Boards, to plan a course of action and report at a meeting in Washington in the following May, during the meeting of the American Medical Association.

The secretary was chosen by the Board to attend the proposed meeting in Washington of representatives of State Boards of Health. [The secretary's report of this meeting is printed on pages 16-18 of this Report.]

Drs. John Avery and J. H. Kellogg were appointed a committee to examine the State capital in respect to its sanitary condition.

In accordance with the request of Governor Begole, a committee, composed of Drs. Henry B. Baker, J. H. Kellogg, and V. C. Vaughan, was appointed to examine the sanitary condition of the State Reform School and surroundings. [For their report, see pages 30-31 of this Report.]

Dr. Kellogg spoke of the importance of the Board using a part of its appropriation for the making of special investigations; and Dr. Vaughan spoke of the need of a fully-equipped sanitary laboratory at the University.

The following resolutions were adopted:

*Resolved*, That a sum not exceeding three hundred dollars be appropriated to pay for results of original investigations in sanitary subjects, provided such results be presented to and accepted by this Board.

*Resolved*, That this Board desires to encourage special investigations into sanitary conditions at localities, with special reference to water supply, ventilation of public buildings, and the origin of epidemics of diphtheria and other contagious diseases.

Dr. Kellogg presented, and read a portion of, his report for the committee on the present knowledge respecting diphtheria. [The subject had been presented at a previous meeting, and the report had already been ordered published in the Annual Report. See pages 44-67, Report for 1883.]

Dr. Avery's paper on "Contagious and Infectious Diseases" was ordered to

be printed in the Annual Report for 1883. [See pages 249-253 of that Report.]

SPECIAL MEETING, HELD IN DETROIT, FEBRUARY 12, 1884.

This meeting was held at the Russell House, in Detroit, February 12, 1884, at 1 o'clock.

The following members of the Board were present: John Avery, M. D., president; Henry F. Lyster, M. D., John H. Kellogg, M. D., Arthur Hazlewood, M. D., Henry B. Baker, M. D., secretary.

The president, secretary, and other members of the State Board of Corrections and Charities were also present, and a joint meeting of the two boards was then held for the purpose of examining plans for the proposed asylum for criminal insane at Ionia. Gordon W. Lloyd, the architect, was present, and explained the plans.

After some time spent in examining the plans, and in discussing various points involved therein, it was suggested that the secretary of the State Board of Health write out and give to the secretary of the State Board of Corrections and Charities a memorandum of the suggestions made by members of this Board for the improvement of the plans. [The memorandum was afterwards made, and is printed on page 36 of this Report.]

The State Board of Health, in a meeting by itself, then directed its president and secretary to communicate to the Michigan State Board of Corrections and Charities the result of the examination of the plans. [The communication is printed on pages 35-36 of this Report.]

REGULAR QUARTERLY MEETING AT LANSING, APRIL 8, 1884.

The meeting was called to order by the president at 9 A. M. The following named members were present: John Avery, M. D., President; Victor C. Vaughan, M. D., C. V. Tyler, M. D., Arthur Hazlewood, M. D., and Henry B. Baker, M. D., Secretary.

Dr. Vaughan read a paper by Dr. C. P. Pengra, on "Impure Ice," which was ordered to be printed in the report for 1884. [See pages 79-81 of this Report.] The secretary read his quarterly report of work in the office.

The secretary presented a communication from J. N. McCormack, M. D., Secretary of the Kentucky State Board of Health, and himself, who were a committee to seek the coöperation of all State Boards of Health in a proposed conference of representatives of State Boards, to be held in Washington in May, 1884, during the meeting of the American Medical Association. The secretary having been appointed at a previous meeting, the delegate from this Board, he asked now for any suggestions or instructions which the members of the Board would give. The subject was thoroughly discussed by the several members of the Board. The opinion seemed to prevail that it is desirable that subjects such as that of the nature of typhoid fever, and best methods for its prevention, might be submitted profitably to a discussion by representatives of boards of health, before any new and radically different views from those usually taught were promulgated; that communicable diseases conveyed from one State to another should be subjects for notification from one board of health to another whenever this is possible; that the proposed meetings of delegates might be held economically at the same time as those of the American Public Health Association; and that proper influence should be exerted toward securing national aid for the prevention of the introduction of contagious and infectious diseases into this country.

*Afternoon Session.*

The same members were present, with the addition of Dr. Lyster.

The secretary was authorized to print and distribute a list of the health officers in Michigan.

The secretary presented a compilation of the returns made by the clerks of counties relative to the physicians registered in this State, and he was directed to publish the compilation. [It is printed on pages 115–121 of this Report.]

The secretary presented a blank which he had prepared, designed to be supplied to all supervisors in the State, for their use in complying with the law (No. 167, Laws of 1883) requiring them to report all practitioners of medicine. The law does not require action by this Board, and on motion the subject was indefinitely postponed.

Dr. Baker offered the following resolutions, which were adopted:

*Resolved*, That the Michigan State Board of Health respectfully and earnestly memorializes Congress to pass the bill introduced into the House of Representatives January 8, 1884, by the Hon. Casey Young, or some similar bill, providing for the prevention of the introduction of infectious diseases into the United States, and for obtaining information of the sanitary condition of foreign ports and of places in the United States, and for procuring information relating to climatic and other conditions affecting the public health.

*Resolved*, That we consider the National Board of Health the best existing, and the proper agency to carry on the work mentioned in the preceding resolution.

The secretary was authorized to have the document on the "Restriction and Prevention of Scarlet Fever" reprinted in numbers not to exceed twenty-five thousand.

The secretary was authorized to publish in the Annual Report for 1883 the summarized abstract of the public health legislation in 1883. [It is printed on page 116 of the Report for 1883.]

The secretary was authorized to publish in the Annual Report for 1883, a statement of the examination of plans for public buildings, by the State Board of Health, during the year ending September 30, 1883. [It is printed on pages 117–120 of the Report for 1883.]

The secretary was directed to publish, in the Annual Report for 1884, his report of various outbreaks of trichiniasis in Michigan. [It is printed on pages 1–4 of this Report.]

Dr. Lyster read a report of the committee to examine the Wayne county poor house and the Wayne county asylum for the insane. It was accepted with thanks, and ordered to be printed in the Annual Report for 1884. [It is printed on pages 22–29 of this Report.]

The subject of text-books on physiology and hygiene, with special reference to the effects of alcohol, etc., was considered. [The action of the Board on this subject at this meeting, and also at the next meeting, July 8, 1884, is printed on pages 54–55 of this Report.]

Dr. Hazlewood, chairman of committee to examine the Van Buren county jail, reported that when the committee were ready to examine the jail, they learned that the judge of the circuit which includes Van Buren county had already condemned it and forbidden its use. The examination was therefore unnecessary, and was not made.

The report of the committee on the examination of the Barry county jail was ordered printed in the Annual Report for 1884. [It is printed on pages 19–20 of this report.]

Dr. Hazlewood, committee on the finances of the Board, made a report, which is printed on page xxxiii of this Report.



## REGULAR QUARTERLY MEETING, JULY 8, 1884.

Present—Hon. John Avery, M. D., president; J. H. Kellogg, M. D., Arthur Hazlewood, M. D., Victor C. Vaughan, M. D., C. V. Tyler, M. D., and Henry B. Baker, M. D., secretary.

H. R. Gass, Superintendent of Public Instruction, appeared before the Board and presented a list of seven text-books on physiology, with a request that this Board unite with the State Board of Education in approving them.

The remainder of the forenoon session was devoted to the discussion of the subject of text-books on physiology. Dr. Hazlewood read a paper embodying his views respecting the books submitted for examination.

*Afternoon Session.*

Henry F. Lyster, M. D., was present, in addition to those who were present at the forenoon session.

Dr. Baker mentioned the "Charts of Life," by Henry S. Stebbins, as having been presented to this Board for examination under the law relative to text-books on hygiene, etc. The Board thought that they were not called upon by law to examine them, because the charts are not "text-books."

Dr. Kellogg offered a resolution which was adopted, giving the partial endorsement of the Board to seven text-books on hygiene, etc. [The resolution with the list of books is printed on pages 54-55 of this Report.]

The secretary read his quarterly report of work in the office of the Board. [An abstract of the report is printed on page xlv of this Report.]

The secretary read an account of an outbreak of small-pox in Osceola county, caused by a German immigrant from Hamburg, arriving in steamer "Weser." [An account of it is printed on pages 279-280 of this Report.]

The secretary read an account of four outbreaks of cheese poisoning in Michigan, at Middleville, Jerome, Jonesville, and Big Rapids. [It was afterwards incorporated into a more extended report in regard to cheese poisoning, which is printed on pages 122-128 of this Report.]

On motion of Dr. Kellogg, Dr. Baker was requested to attend the proposed conference of representatives of State Boards of Health at St. Louis, Mo., at the time of the meeting of the American Public Health Association.

Dr. Vaughan, committee on poisons, etc., read a report of his investigations into the cause of the several poisonings by cheese in this State during the past few months. He had analyzed samples of the cheese, and had visited the factory where the poisonous cheese was made. He had also made a study of the literature of the subject.

Dr. Baker, committee on diseases of animals, etc., read an account of a conference of veterinarians in Brooklyn, N. Y., relative to pleuro-pneumonia; also a memorandum relative to a micrococcus of pneumonia.

Dr. Hazlewood presented a circular relative to the International Conference on Hygiene at The Hague, August 27, 1884. On his motion the Board voted to subscribe for the proceedings of the congress. As it was known that Dr. Hazlewood thought of going to Europe this year, and as it was possible he might be at The Hague at the time of the meeting of the Congress of Hygiene, on motion of Dr. Kellogg, it was voted that Dr. Hazlewood be requested to represent this Board at the Congress in case he visits Europe, and finds it convenient to do so. [Dr. Hazlewood attended the Congress.]

The secretary was directed to revise the document on the Restriction and Prevention of Diphtheria, so far as relates to the laws amended by the legisla-



ture, and to print a new edition of not to exceed twenty-five thousand copies.

The secretary was authorized to purchase of Dr. J. H. Long, of Chicago, one hundred ozone scales for the use of meteorological observers of this Board.

Dr. Kellogg read the report of the special committee to examine the Washenaw county jail. [It is printed on pages 20-22 of this Report.]

Dr. Vaughan read the report of the special committee to examine the Jackson county jail. [It is printed on page 29 of this report.]

Dr. Baker read a report of the Conference of Representatives of State Boards of Health, held at Washington, D. C., May 7, 1884. [It is printed on pages 16-18 of this Report.]

Dr. Baker presented a résumé of the work of other boards of health.

Dr. Lyster, committee on epidemic diseases, etc., said the committee would like to receive suggestions relative to the subject of cholera, the prospect of its reaching this country, best means for its prevention, etc. The subject was discussed by members of the board. The secretary was directed to prepare, print, and send to local boards of health, a circular calling attention to the danger of the introduction of cholera, and the necessity for precautionary measures. The secretary was directed to submit the circular, before printing, to Dr. Lyster, chairman of committee on epidemic diseases. [It is printed on pages 47-51 of this Report.]

The secretary presented and commented upon the mortality bulletin lately issued by the State Board of Health of New York. It corresponds (so far as mortality reports can correspond to sickness reports) to the weekly bulletins of *sickness* in Michigan issued by this Board, which he considered better for purposes of studying the relations of diseases to climatic and other conditions.

Dr. Hazlewood said the statistics of sickness would be much more valuable than the statistics of mortality if we could get full reports of the sickness.

The secretary said we could hardly expect to obtain a record of *all* the sickness, at present at least; but that the reports which the Board now receives seem to be very satisfactory; that they seem to supply knowledge of the sickness which occurs throughout the State, as useful as is the knowledge which business men rely upon for their purposes, when they examine the wheat in the top of a bag of wheat and estimate the rest of what is in the bag as the same; and estimate what is in the greater part of the load to be the same as is in the few bags which they examine. Such knowledge is sufficient for the practical affairs in business; and, judging by the results of study of the information of sickness from several diseases, which has been gained in this way, the reports of sickness are sufficient for our purposes, because they represent fairly well the sickness which occurs. He exhibited several diagrams showing the curves representing sickness in Michigan from pneumonia, bronchitis, and remittent fever; and asked attention to the very great regularity which the curves maintained by months in different years. He thought that such regularity would not be found unless the reports were reasonably true statements of the sickness; and, considering the extremely close relations which were found between the curves representing sickness and those representing certain meteorological conditions, he thought the reports of sickness were capable of yielding even more than had been anticipated in the way of useful information.

An account of the reorganization of the Louisiana State Board was given by the secretary; also a statement that it had asked for and received aid from the New Orleans Sanitary Association, an organization which seems to be able to get and use large sums of money, and with which the former board of health

had no coöperation. The secretary also read an account of resolutions adopted by a conference called by the Louisiana Board of Health, and subsequently adopted by the New Orleans Auxiliary Sanitary Association, outlining a new plan for international sanitation of ships. He also read the comments in New Orleans papers relative to this proposed plan, and to the "forty days' quarantine" established by the Louisiana Board; and he made comments on the proposed new plan which he considered somewhat visionary and not as promising as would be the cordial support of the National Board of Health and its methods of securing the international sanitation of ships.

A statement relative to an outbreak of small-pox in Bath, Clinton county, in February, 1884, the disease having been brought from a New Orleans hospital, was read by the secretary. The disease was promptly stopped by Dr. A. R. Hicks, the health officer of Bath. The secretary was instructed to express to Dr. Hicks the thanks of the Board for his prompt and successful action in suppressing the outbreak of small-pox in his jurisdiction. [See page 278 of this Report.]

On motion of Dr. Lyster, the secretary was directed to transmit to the State Board of Health of New York, an expression of the regret of this Board at the death of Dr. Elisha Harris, late Secretary of the New York State Board, and the recognition by this Board of the ability and prominence of Dr. Harris as a sanitarian.

A communication from N. D. Lee, M. D., health officer of Saginaw, Mich., stating that the board of health of that city had decided that measles is not a disease dangerous to the public health, was presented by the secretary.

On motion of Dr. Kellogg, the following resolution was adopted:—

*Resolved*, That Dr. R. C. Kedzie be asked to make special investigations for this Board on the influence on health of decomposing saw-dust, and that not to exceed one hundred dollars of the funds set apart for special investigations be used for this purpose.

## ABSTRACTS OF QUARTERLY REPORTS PRESENTED BY THE SECRETARY AT REGULAR MEETINGS OF THE BOARD, OF WORK DONE IN THE OFFICE OF THE STATE BOARD OF HEALTH.

QUARTER ENDING OCT. 9, 1883.

A report of the July meeting of the Board was sent to our sanitary and medical exchanges.

Arrangements were completed for the sanitary convention at Muskegon. Invitations to the convention and reduced rate certificates were distributed. Since the convention (which I attended) the minutes and addresses have been edited and sent to the printer. The printing of these as an appendix to the Report has been begun, and proof on the first twenty printed pages has been read.

A blank form was prepared for use of practitioners of medicine in complying with Act No. 167, Laws of 1883, which requires all practitioners and students of medicine to file with the county clerk a sworn statement relative to their qualifications. This blank was approved by a majority but not by all the members of the Board (as is requisite to order printing during the interval of meetings) and hence was not printed. As the office was, however, better prepared

to respond to the numerous inquiries received from county clerks, makers of legal blanks, and others, the work of preparing the blank was not lost.

The circular on duties of health officers and local boards of health, No. 55, revised in conformity with new laws and the demands of experience, has been printed as No. 64. It has been distributed to health officers and other members of all local boards of health, to all newspapers in the State, and to the sanitary and medical exchanges of the Board, to members and correspondents of the Board, and to Secretaries of other State Boards of Health.

The Report for 1882 has been distributed to persons on the list supplied by Dr. Hazlewood, to all health officers in Michigan returned to this office, and to presidents and clerks of village and city boards of health.

The usual distribution of the weekly bulletins of sickness and of meteorology, and of the monthly mortality statements for Lansing have been made.

The correspondence of the office makes 572 pages of letter-book record of letters sent, besides many postal card communications not copied.

The compilations of meteorology and weekly reports of sickness, for 1882, have been nearly completed.

The annual inventory and report of property has been made and will be presented at this meeting.

From week to week, as magazines and other accessions to the library are received, considerable work is necessary to make references by which at any time papers on a given subject may be found; also to send out books and documents requested by health officers and others, to look up papers on various subjects as required, and pack and ship books, etc., to those who undertake to write papers for sanitary conventions or other uses. During the past quarter, three such demands for books and papers have been filled.

#### QUARTER ENDING JAN. 8, 1884.

A successful sanitary convention had been held at Ionia; and arrangements had been commenced for holding one at Hillsdale. The proceedings of the Muskegon, Pontiac, and Reed City conventions had been printed. Special meetings of the Board had been called at the State Reform School to examine plans for a new building; at Detroit to attend American Public Health Association; and at Ionia at the time of the convention. A leaflet on contagious diseases had been translated into French, Danish, Norwegian, and Swedish, for distribution among citizens of Michigan who speak those languages. A very general distribution of circulars on communicable diseases and on the work of health officers had been made to the health officers of cities, villages, and townships in Michigan, and similar documents were distributed at Ionia, and at the State Teachers' Association. Circulars, blanks, etc., had been sent to health officers and clerks of all cities, villages, and townships in Michigan for their annual report, including that of the diseases dangerous to the public health. Notice had been sent to health authorities in several parts of the State warning of the shipment of diseased cattle into such localities. The regular distribution of weekly bulletins of sickness and of meteorology, the yearly distribution of material for meteorological reports, and the quarterly distribution of blanks to observers of diseases had been made.

#### QUARTER ENDING APRIL 8, 1884.

The amount of office work during the quarter was large and included: The perfecting of arrangements for holding a Sanitary Convention at Hillsdale;



preparation of the proceedings of the Ionia Sanitary Convention for the printer; the making of a compilation of the public-health laws of Michigan; proof-reading on 96 pages of the Annual Report; issuing blanks for the return of the new health officers in each city, village, and township in Michigan; issuing the regular weekly bulletins of meteorology and of sickness in Michigan; the correspondence of the office (postals are not usually copied) covering 750 pages of letter-copying book, of which over 150 pages have direct reference to the prevention and restriction of communicable diseases in Michigan; and the regular computations of data relating to meteorology and sickness.

#### QUARTER ENDING JULY 8, 1884.

The work of the office in compiling reports of sickness, meteorology, and of proof-reading, correspondence, etc., has continued as heretofore. A compilation of the Public Health Laws of Michigan has been printed, and is nearly ready for distribution. The document on Restriction and Prevention of Scarlet Fever has been revised and 20,000 copies printed for gratuitous distribution. Proof on most of the Annual Report has been read, and it is now printed up to page 224.

A second demand for the return of names and addresses of health officers has been made on delinquent townships, cities, and villages. Addresses of about 1,050 health officers have been received and recorded. As fast as addresses of health officers for 1884 are received, there are sent to each such officer enough copies of the revised circular on the work of health officers and local boards, to supply each member of the Board with a copy. Documents on the Restriction and Prevention of Contagious Diseases are sent with this circular, and a blank for notification to this office of an outbreak of a dangerous communicable disease. During the quarter about 120 letters and 8,000 documents have been sent to local health officers where contagious diseases have been reported present, the documents being for general distribution among the neighbors, who it is believed are more likely to read them carefully at such times.

#### SPECIAL REPORTS, COMMUNICATIONS, ETC.

A summary of certain reports relative to certain communicable diseases, is printed on pages 251-290.

#### CEMETERIES IN CITIES, AND THE PUBLIC HEALTH.

##### OPINIONS OF EMINENT MEN IN THE STATE AND THE UNITED STATES.

The following correspondence, which explains itself, is printed to show the opinion of eminent sanitarians and physicians concerning the location of a cemetery in a large city, and the consequent danger because of such location to the public health.

A copy of the following letter was sent to twenty sanitarians and physicians in and out of the State:—

MICHIGAN STATE BOARD OF HEALTH, }  
OFFICE OF THE SECRETARY, }  
Lansing, Michigan, November 5, 1883. }

DEAR SIR:—By request of prominent citizens of Muskegon, I send you herewith a postal addressed to the President of their Sanitary Association, asking a question to which your reply is



earnestly solicited. It is a matter of great consequence to the people of Muskegon, because it is a question which they must decide at this time. I have been requested to send this postal to "twenty eminent medical gentlemen in the State and country at large." I hope you will give the Muskegon people the benefit of your advice.

Very respectfully,

HENRY B. BAKER, *Secretary.*

The question asked on each postal card enclosed with the above letter was as follows: "Do you regard the presence of a large cemetery in a city as detrimental to public health? Your opinion is earnestly desired." Replies to this question were received from fifteen sanitarians and physicians in the State, and from four outside the State, three replying by letter and sixteen by the enclosed postal card.

The essential parts of the replies are as follows:—

GEO. E. WARING, C. E., NEWPORT, R. I., SECRETARY NATIONAL BOARD OF HEALTH:—Unquestionably detrimental.

J. L. CABELL, M. D., UNIVERSITY OF VIRGINIA, PRESIDENT OF THE NATIONAL BOARD OF HEALTH, AND EX-PRESIDENT OF THE AMERICAN PUBLIC HEALTH ASSOCIATION:—I unhesitatingly answer in the affirmative, for, although the evidence is to a large extent indirect and inferential, it yet seems to me to be conclusive. The comparative absence of direct evidence is probably due to paucity of appropriate observations.

E. M. HUNT, M. D., SECRETARY STATE BOARD OF HEALTH, N. J., AND PRESIDENT AMERICAN PUBLIC HEALTH ASSOCIATION:—As a rule I would say extra hazardous. But the question is a relative one. The last report of the State Medical Society of New Jersey discusses it fully,—also a very valuable three pages in the last Report Local Government Board of Great Britain. Soil and water-supply of town are the modifying things.

AZEL AMES, JR., M. D., BOSTON, MASS., SECRETARY AMERICAN PUBLIC HEALTH ASSOCIATION:—I reply to the query of your postal card enclosed at greater length than the card space would permit, because I could do neither the subject nor myself justice therein. I should answer as follows:

1. If your city is thickly settled, and has no parks, and the streets are narrow, the cemetery by making an open space with birds, flowers, and trees makes increased light and air in your city and adds some æsthetic features as well.

2. If the soil is an open gravel and the hard pan close and firm, and its dip is away from the city and its prospective growth, the minimum of harm only can result.

3. If the drainage of the spot is toward the city and the spot low and heavily shaded or with a northern exposure, or western, I count it bad.

4. If the soil is loamy and poorly drained, it is bad.

5. If in *any event* you use wells or the drainage of the spot is toward streams, lakes, or ponds, or their tributaries, used for water supply, I would not permit a cemetery in city limits.

6. If prospective growth is largely in the direction of the proposed spot, I would not have it.

If, however, the site is gravelly, its drainage is good, and away from the city, its wells, or its water courses, if the city is crowded and its lots small, the only harm to come from it is the little that might result from tombs, and the possible emanations from graves, which is, with trees: flowers, and grass all about, likely to be nothing,—the good and the evil under these conditions balance each other. I do not on general principles, knowing that it is hard, almost impossible, to get the conditions all right, like a cemetery in a city, and then, too, it takes valuable property out of taxation. Faithfully yours,

AZEL AMES, JR.

PROF. R. C. KEDZIE, M. D., AGRICULTURAL COLLEGE, MICHIGAN, EX-PRESIDENT MICH. STATE BOARD OF HEALTH, AND EX-PRESIDENT AMERICAN PUBLIC HEALTH ASSOCIATION:—Yes.

J. J. MULIERON, M. D., DETROIT, MICH., EDITOR OF MEDICAL AGE:—While the topographical relation of the cemetery to a township is an important factor in determining the degree of evil of the former, there are no circumstances under which proximity of a decomposing mass of animal matter can be devoid of danger to the living.

LEARTUS CONNOR, A. M., M. D., EDITOR DETROIT LANCET:—I must answer the above inquiry most emphatically in the affirmative. If one thing in sanitary science is better settled than another it is that decomposing human bodies pollute both the air above the ground, the ground itself, and the water that percolates through the ground. Polluted air and poisoned water are certainly detrimental to public health.

O. W. WIGHT, A. M., M. D., HEALTH OFFICER OF THE CITY, DETROIT, MICH.:—Certainly. The universal judgment of sanitarians is that cemeteries should not be located within an area already populated or likely to be populated in the future.

H. O. HITCHCOCK, M. D., KALAMAZOO, MICH., EX-PRESIDENT OF THE STATE MEDICAL SOCIETY, AND EX-PRESIDENT OF THE STATE BOARD OF HEALTH:—For many reasons, which to give "in extenso" would take too long, I do consider a large cemetery in a city as detrimental to health.

FOSTER PRATT, M. D., KALAMAZOO, MICH., EX-PRESIDENT MICH. STATE MEDICAL SOCIETY:—Yes—emphatically yes. All experience teaches that it is; in some localities more and in some less according to the nature and dip of the soil. Any sandy or gravelly soil, or a clay soil with seams and a dip, regular or irregular toward the source of water supply, will carry the results of bodily decomposition into the water used for culinary and drinking purposes. There are other reasons, but this is enough.

GEO. E. RANNEY, M. D., LANSING, MICH., SECRETARY STATE MEDICAL SOCIETY:—Many years ago the unhealthfulness of cemeteries to those living in close proximity thereto was an established theory, which subsequent observations have demonstrated to my mind to be unquestionably true.

Contamination of well water has been directly traced from cemeteries situated more than one-half a mile distant.

A. F. WHELAN, M. D., HILLSDALE, MICH., PRESIDENT STATE MEDICAL SOCIETY:—Yes; yet much would depend on the soil, density of the population, and water-supply. There is air pollution in the emanations from decomposing animal matter, especially in light sandy soils; and morbid germs may be brought to the surface by the action of water and other ways when dry carried in the air.

HON. J. C. WILLSON, M. D., MEMBER BOARD OF CONTROL, STATE INSTITUTE FOR THE DEAF AND DUMB, FLINT, MICH.:—I do not regard it as favorable to health. I would not locate a cemetery in a city as a health resort. I think if you have land outside of city suitable you had better locate your cemetery away from your living room.

ALBERT B. PRESCOTT, M. D., PROFESSOR OF CHEMISTRY, UNIVERSITY OF MICHIGAN:—I do regard such presence as detrimental. Aside from drainage, it is dangerous on account of the free and wide circulation of the ground air. The purifying power of the ground, like that of the air above it, is limited and easily overcharged. If the ground air be loaded with more putrescent vapor than it can oxidize, then poison is carried through the porous earth.

HON. HENRY F. THOMAS, M. D., HEALTH OFFICER, ALLEGAN, MICH.:—I do not hesitate to say that in my opinion the presence of a large cemetery in a city is detrimental to public health. I have some notes that I think verify this statement.

C. M. STOCKWELL, M. D., PORT HURON, MICH., EX-REGENT MICHIGAN UNIVERSITY:—The answer must depend largely upon soil, water supply, and present use. If water supply is derived from springs or wells within the town, most emphatically *yes*. If in constant present use, *yes*, for there must be frequent exposure of earth impregnated with decaying organic matter. Specially if it be the only receptacle of its dead in a populous portion. The water supply derived from a distant source would remove most objection.

HON. J. M. SWIFT, M. D., HEALTH OFFICER, NORTHVILLE, MICH.:—Cannot give specific or detailed answer by this method, but generally I say yes; unquestionably to my mind. Nor does it require a "large cemetery" under certain conditions of soil and water currents.

HON. I. H. BARTHOLOMEW, M. D., LANSING, MICH., EX-PRESIDENT STATE MEDICAL SOCIETY:—I know nothing of the circumstances peculiar to the case which elicits this question, hence my answer can have no special or local significance. Nevertheless I must most unhesitatingly answer the question in the affirmative. It is, perhaps, possible that a cemetery may exist in a city without absolute present detriment or injury to the public health, but if this is conceded in any particular instance, the danger that it may at any time become detrimental and injurious is too great, in my opinion, to allow of its continued existence. To say nothing of the unhealthy effluvia which may be generated, the danger that the adjacent or even distant wells, springs, reservoirs or cellars may become contaminated is too great to be advisedly encountered. As remarked above, it may be possible that the situation of a cemetery in a city to-day is safe, but the putting in of a deep sewer to-morrow may so change the direction and course of the water currents through the soil and subjacent earth that the wells or cellars may become contaminated. Such changes of currents of water near the surface have occurred in this city in more than one instance, and are so likely to occur in any locality that the people in our cities can not be too careful to keep the soil as free as possible from all contaminating impurities whatever. Hence I conclude that a large "cemetery ought not to be allowed continued existence in any city," meaning of course in the central portions thereof. As a rule every city ought, if possible, to so locate its cemetery that its corporate boundary may include it so that proper police and other regulations may be enforced, but let it lie as far as possible from the center of population.

G. W. TOPPING, M. D., DEWITT, MICH., HEALTH OFFICER, EX-PRESIDENT STATE MEDICAL SOCIETY:—I do regard the presence of a cemetery, either large or small, in a city as detrimental—yea, very dangerous—to the public health. I think poison enough may be derived from one human body to contaminate the well water and the air for a long distance under favorable circumstances for its diffusion. I should hesitate much to drink or use the water from a well situated one-half mile from a cemetery, if the intervening soil was gravelly or sandy, unless said water had been recently subjected to a searching chemical examination.

I think that subterranean streamlets passing through soil saturated with organic elements may under favoring conditions carry these decomposing substances much farther than the distance above named.

The air in the vicinity of large cemeteries must be considerably contaminated by gaseous substances which the earth does not fully absorb.

To locate a cemetery near human habitations is a gross violation of hygienic laws which are now very generally recognized and heeded by every enlightened community.

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This Eleventh Annual Report is respectfully submitted.

HENRY B. BAKER,  
*Secretary.*





# TRICHINIASIS IN MICHIGAN.

BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

The restrictions placed on the importation of American pork in France and Germany led to the appointment of an investigating commission by the President of the United States. The following circular of inquiry was received from that commission:

## Special Commission on American Pork Appointed by the President of the United States.

With a view to ascertaining the extent to which Trichiniasis prevails in the United States, the following questions have been formulated, to be addressed to the secretaries of the various State and city boards of health. As it is desirable that the report of the commission should be presented to Congress at once, the undersigned would beg a speedy response as possible:

1. How many cases of trichiniasis have come to the knowledge of your board? Please give dates as far as practicable.
2. In how many cases was there a microscopic identification of the trichinæ in the human subject and in the suspected meat?
3. How many of the cases were fatal?
4. Have any cases of meat-poisoning other than by trichinæ come under your observation? If so, how many? and of what nature?

Yours respectfully,

GEO. B. LORING, }  
C. F. CHANDLER, } *Commission.*  
D. E. SALMON, }

Address reply to GEO. B. LORING, *Commissioner of Agriculture*, Washington, D. C.

In reply to this circular the following communication was sent to the commissioner of agriculture:

OFFICE STATE BOARD OF HEALTH, }  
*Lansing, Michigan, Feb. 9, 1884.* }

*To Hon. Geo. B. Loring, M. D., Prof. C. F. Chandler, M. D., and D. E. Salmon, M. D., Special Commission on American Pork, Washington, D. C.:*

GENTLEMEN: The communication, without date, to this board, containing questions by the special commission on American pork, appointed by the president of the United States, in relation to trichiniasis in Michigan, is received.

The law constituting the State Board of Health of Michigan went into effect July 30, 1873; the Board has therefore been in operation a little more than ten years, and the collection of such information as you desire has been made only during that period of time. It is probable that a considerable proportion of the cases which occur are never recognized as trichiniasis, and that not all cases which are recognized in Michigan are reported to this Board.

Particulars as to ten outbreaks of trichiniasis in Michigan since December 1, 1866, are as follows:

OUTBREAKS OF TRICHINIASIS IN MICHIGAN.

1. A fatal case of trichiniasis occurred in Detroit, Mich., in December, 1866. Upon *post mortem* examination large numbers of trichinæ were found in the abdomen, and a lesser in the muscles of the leg (Dr. Herman Kiefer).

2. Five cases occurred in Port Huron, Mich., in January, 1874, with two deaths. The cases occurred in one family, and were caused by \*eating salted smoked ham. (Reported by Dr. M. Northup, Port Huron, Michigan.)

3. Several cases of trichiniasis occurred near Flint, Mich., in the fall of the year 1875. Cases also occurred there in June, 1876. In the last outbreak, at least, trichinæ were found, by microscopic examination, in the meat, and also in a particle of muscle of the leg of one of the patients. (The cases were in the practice of Dr. A. B. Chapin, of Flint, Mich., now of Detroit.)

4. Five cases occurred in Otsego township, Allegan county, Mich., in Feb., 1877. All recovered; all were in one family, the members of which had eaten raw ham. Members of another family ate a small quantity of the meat and were also sick, but recovered without medical attendance. Trichinæ were found in the meat by microscopic inspection.

5. Three cases with one death occurred in the city of Ionia, Mich., in 1873, in the family of Mrs. Strunck. The meat was eaten raw. A microscopic examination was made of the meat, and I believe trichinæ were also identified in the human subject.

6. I am informed that cases, and one or more deaths, occurred in the vicinity of Ionia, Mich., in the summer of 1880, in the practice of Dr. H. B. Barnes. Trichinæ were found in the pork, and also, I believe in the muscles of those who died.

7. Five cases and two deaths occurred in the family of a German named Rumsock, in Lansing, Mich., in the last of January, 1881, and the first of Feb., 1881. The cases were in the practice of Dr. Dolan, of Lansing, who has since died. Great numbers of non-capsuled trichinæ were seen by Dr. Geo. E. Ranney and others in the muscles of a boy who died. (I still have slides showing the trichinæ as taken from the muscles of a person in the family, who died.) Part of the meat was eaten raw. It was not examined for trichinæ; but the hog was sick and was killed to avoid loss of the animal.

8. Five cases of trichiniasis occurred in Vickeryville, Montcalm county, Mich., in December, 1883. All resulted from eating the flesh of one hog. One death occurred. The boy who died had at different times eaten small pieces of pork only partially cooked by holding them on a fork before the fire. He had also eaten raw, on several occasions, little bits of sausage made from the flesh of the hog. Two others had eaten the meat cooked, but probably rare done. The other person had eaten raw a little bit of sausage, perhaps half an ounce, but the rest of what he ate was well cooked. Trichinæ in abundance were found in the pork, specimens of which are now in this office. (Reported by Dr. J. Tennant, Carson City, Michigan.)

9. Four cases occurred in January, 1884, in the city of Niles, Mich. One death has occurred, and three persons are now seriously sick. The pork contains great numbers of trichinæ, as determined by observations made at Niles, Ann Arbor, and in this office.

\* [A letter from Dr. Northup, dated Port Huron, Feb. 25, 1884, states that "quite a number of persons examined with the microscope the muscles of Mrs. Ludwig after her death, and all saw the parasite."]

Further details as to the five cases occurring at Port Huron, and also of the case at Detroit, are given in the published Report of this Board for the year 1875; and of those occurring in Otsego, in the Report of this Board for the year 1877.

Such answers as I am able to give to the four questions asked by your commission, have been summarized from the foregoing particulars, and are given with each question, as follows:

*Question 1.*—How many cases of trichiniasis have come to the knowledge of your board? Please give dates as far as practicable.

*Answer 1.*—I am able at this time to send you facts concerning *ten* outbreaks of trichiniasis occurring in Michigan. In three of these the number of cases was not stated. In seven outbreaks there was a total of twenty-eight cases. The dates are given in most instances, in the report accompanying this.

*Question 2.*—In how many cases was there a microscopic identification of the trichinæ in the human subject and in the suspected meats?

*Answer 2.*—In two outbreaks the observer did not state whether any microscopic examination was made. It is believed that the human muscles were examined in five of the outbreaks, and in each of them trichinæ were found; in three of these it is positively known that trichinæ were found present. In seven outbreaks the pork was examined; and in each of the seven, trichinæ were found in the pork. In the other outbreak, microscopic examination was made only of the muscles of the human subject, in which trichinæ were found.

*Question 3.*—How many of the cases were fatal?

*Answer 3.*—In one outbreak it was stated that there were no fatal cases; in one outbreak where fatal cases occurred the number was not stated; in one outbreak it was not stated whether any fatal cases occurred; in another outbreak, now in progress, one death has already occurred; and in six other outbreaks seven deaths were reported, making, in all in which the number was reported, eight deaths.

*Question 4.*—Have any cases of meat-poisoning, other than by trichinæ, come under your observation? If so, how many? and of what nature?

*Answer 4.*—H. A. Brigden, supervisor of Briley township, Montmorency county, Mich., reported to this office Jan. 16, 1883, that members of his family had been made sick by eating of pork, which upon being suspected, and thrown to the cats caused the death of three, with great thirst and vomiting. One of the symptoms complained of by members of the family was a burning sensation in the stomach. There was no diarrhea. Specimens of the meat were submitted to a chemical analysis without detecting any injurious substance. Specimens were submitted to Prof. T. J. Burrill, of Champaign, Illinois, who reported no trichinæ, but an abundance of a large species of micrococcus.

In the fall of 1883, Dr. W. F. Reed, of Maple Rapids, Clinton county, Mich., reported sickness in his practice which followed the eating of pork in the form of "head cheese." Trichinæ were the suspected cause of the sickness, but so far as I have heard, none were found. The meat was sent away for examination, the result of which I have not learned.

Of the five cases of trichiniasis at Vickeryville, three of the persons affected did not eat the raw meat, but did eat it cooked. This seems to be of importance, because it shows the necessity of abstaining from rare pork or ham, unless the meat has been inspected microscopically and found free from trichinæ.

Very respectfully,

HENRY B. BAKER, *Secretary.*



The cases at Niles referred to in the foregoing communication were in the family of a German, Fred Vetter. Four persons were sick; two died; two recovered.

July 6, 1884, Dr. F. Goodwin, of Cassopolis, reported that there had recently been four cases of trichiniasis in one family in Cass county. One young man (who ate the most raw ham) died in about six weeks; the other three children recovered after a long sickness. Rats had been fed to the sow from which they had all eaten raw lean ham, soon after which they were all taken sick. Dr. Tompkins, of Cassopolis, with a microscope found trichinæ in flesh from the young man who died. They were seen by others.

There were six cases at Vickeryville, instead of five as stated in the preceding communication.

The boy (K. H., aged about 11) who died had at different times eaten small pieces of the pork only partially cooked by holding them on a fork before the fire; he had also eaten raw, on several occasions, little bits of sausage made from the flesh of the same hog.

This boy's father ate a little of the raw sausage, and his sickness ranked third in severity.

The boy's sister (aged about 18) ate only cooked meat, and her sickness was comparatively mild.

Some of the fresh pork had been sent to a neighbor, Mrs. S. (aged about 43.) She preferred and ate the parts which were rare done; her sickness was second in severity, of the six cases. Her son (aged about 21) preferred and ate that which was more thoroughly cooked. His sickness was milder.

Some of the fresh pork had been sent also to another neighbor, Mr. T. (aged about 35.) He ate raw a little of the sausage, perhaps half an ounce, but the rest of what he ate was well cooked. His sickness was quite severe.

The hog from which the diseased pork was made had been sick a day or two in December, 1882, but recovered in a short time and showed no further signs of disease. The hog seemed to be in perfect health when killed; the meat looked and tasted well; some of it was used in Mr. H.'s son's family without injury.

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## PROTECTION FROM DISEASED ANIMALS AND DISEASED MEAT.

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BY HENRY B. BAKER, M. D., COMMITTEE ON DISEASES OF ANIMALS IN  
THEIR RELATION TO PUBLIC HEALTH.

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Act No. 163 of the Laws of 1869 (sections 1742, 1743, and 1744 of the Compiled Laws of 1871, or §§ 1688-1690 of Howell's Annotated Statutes) provides that the Governor may, whenever he shall be satisfied of the necessity of such an appointment, appoint three cattle-commissioners, to hold office for two years and to report annually to the secretary of the State Board of Agriculture, who shall endeavor to prevent the spread of dangerous diseases



among animals, and to protect the people of the State from the dangers arising from the consumption of diseased meat. The act further specifies certain powers of the commissioners, but it makes no provision for payment of their expenses or for compensation to the commissioners in carrying on their work.

For several years no commissioners were appointed. During the last year of Governor Croswell's administration the following persons were appointed commissioners: J. B. Griswold, M. D., *Grand Rapids*; A. J. Murray, V. S., *Detroit*; and S. B. Mann, *Adrian*. They have since been reappointed; but for lack of money the commissioners have not been able to do all the work that has appeared desirable to prevent and suppress dangerous diseases among animals. During the session of the Legislature of 1881-2, the secretary of this Board and others went before the Senate and House Committees on public health and on agriculture, and urged the importance of legislative action to provide for preventing the spread of communicable diseases of animals. In his retiring message in 1883 Governor Jerome called attention to the necessity for a thorough revision of the law in order to accomplish the desired object.

A bill more definitely prescribing the duties of the commissioners, somewhat enlarging their powers, and providing compensation for their expenses and services was introduced into the Legislature in 1883 by Mr. Alvord, of Hillsdale county. Hon. Isaac Marston and others went before the Senate and the House committees on public health and on agriculture, in 1883, at a joint meeting of members of the four committees, and set forth the necessity for an appropriation to enable the cattle commission to do the work for which it was appointed. Mr. Alvord's bill and also a bill prepared by Senator Monroe, of Van Buren county, for a similar object failed to pass. Mr. Alvord's bill also provided that not to exceed fifty dollars might be paid to the commissioners for their past services and expenses.

There is no known reason why Michigan can be expected to escape such outbreaks of contagious diseases among domestic animals as have occurred in neighboring States, and it is the part of wisdom to be prepared for such an outbreak by having a central agency ready to act with authority whenever the danger occurs, and in such communication with local officers as to be able to secure prompt coöperation with and by the local authorities for the suppression of the disease. But it is not alone an outbreak of a dangerous disease among animals in Michigan that is to be feared. Diseased animals which the inspectors of a city outside of Michigan would not permit to be slaughtered for food may be shipped to Michigan and be slaughtered and sold for food in towns where there is not an adequate inspection, before the danger is hardly known.

#### DISEASED CATTLE.

Such an instance of the shipping of diseased cattle to Michigan to be slaughtered for food occurred in the fall of 1883; and although the sale of the animals for food was partly prevented by prompt action on the part of local boards of health and of the State Board of Health, the danger of such a sale was shown to be so great as to demand special consideration. What the danger was and what was done to prevent it may appear from the following correspondence on the subject.

In October, 1883, the following letter was received from J. H. Jones, member of the Grand Rapids Board of Health:

OFFICE OF BOARD OF HEALTH, GRAND RAPIDS, MICH., *October 20, 1883.**Henry B. Baker, Secretary State Board of Health:*

DEAR SIR,—I write you to ascertain if there is any law relative to the importing of diseased animals for food into the State; and if so, what is the penalty, and the law governing it. Is there a State commission for the inspection of diseased animals? If so, who are they, and what are their duties?

We have had—at least the butchers that furnish this market with meat did intend to throw a large lot of diseased meat on the market; but we headed them off, and compelled them, with the assistance of the board of health of the township of Paris, to slaughter them and turn them over to the glue-factory. There were 17 in all that were badly diseased. The disease is what they call the “lump-jaw.” Do you know anything relative to this disease called “lump-jaw?” If it is an infectious disease, please give me all the information you can on the subject at the earliest moment.

Yours respectfully,

J. H. JONES.

*No. 13 West Bridge Street.*

To this letter was sent the following reply:—

MICHIGAN STATE BOARD OF HEALTH,  
OFFICE OF THE SECRETARY, LANSING, MICH., *October 23, 1883.**J. H. Jones, No. 13 West Bridge Street, Grand Rapids, Mich.,—*

DEAR SIR,—Your letter of October 20 has been received. I do not know by that name the cattle disease you mention as “lump-jaw.” Is it glanders?

So far as the subject has any relation to public health, it is the duty of the local board of health to attend to it. There is a cattle commission in this State, but as the Legislature has not appropriated any money for its use, it is practically inactive. The members are: J. B. Griswold, M. D., Grand Rapids; A. J. Murray, V. S., Detroit; and S. B. Mann, Adrian.

The law bearing on this subject will be found in Compiled Laws of 1871, sections 1742 and 1743. That law is practically inoperative for the reason given above.

I shall be pleased to hear from you again with reference to this disease.

Very respectfully,

HENRY B. BAKER, *Secretary.*

The following letter was also received from H. N. Cargill, clerk of the Grand Rapids Board of Health.

OFFICE OF BOARD OF HEALTH, *Grand Rapids, Mich., Oct. 22, 1883.**H. B. Baker, Sec. State Board of Health, Lansing:*

DEAR SIR,—This board had been suspicious for some time that our string butchers were handling more or less cattle that were not suitable for food. Saturday, the 13th, we received, through the chief of police, a despatch from O. C. DeWolf, health commissioner of Chicago, that three car loads of cattle were shipped from there to Grand Rapids, and two car loads to Muskegon; among them were a number of diseased cattle, he thought about 20 to Grand Rapids and 17 to 19 to Muskegon. The train started the night previous, Friday, and arrived here Saturday about two o'clock, but we did not get the despatch until they were unloaded and started for the yards. It raining very hard, we did not go out to the slaughteryard until Sunday morning, when we found that there were 16 cattle in the yard, and they had slaughtered 6 which were hanging in the slaughter-house.

I then went to the supervisor of the town, who is president of the town board of health, and got an order from him to the owners of the cattle, forbidding them to remove any of the animals until further orders. They had secreted the heads of those that were killed. The town board deputized and ordered the city inspector to act in their name, and to take those cattle and dispose of them. He went to the yards Monday morning with me and inspected the cattle, and found that 8 of the live cattle were afflicted with the disease called cancerous or lump jaw, and the six that were slaughtered also.

It is not discernible to an ordinary observer, or (unless he is acquainted and handled such cattle) to an expert in the meat when well dressed; but a microscopic examination might discover it at any time, especially after the first stages of the disease have passed. Veterinarians here claim that it is not common in this country, but is common in European countries. In the last stages the jaws become enlarged and ulcerated through and through, and discharging both into the mouth and outside. It is hereditary and contagious. I send you Dr. Hunter's opinion on a printed slip, a veterinary surgeon of this city who is considered a thoroughly educated college graduate.

Now, I don't know how much authority the town board had, but we were bound that that beef should not be eaten by the citizens of this city, and therefore the inspector ordered those cattle knocked down and taken to the glue factory, which was done. In looking up the State law in such cases, three commissioners may be appointed by the Governor, if he thinks it necessary, to prevent the spread of contagious diseases among animals, and protect inhabitants of the State from

dangers arising from the use of diseased meat. As to what power the commission has to enforce, or carry into effect these things I don't know. I think the law will have to be amended considerably before it will be of much benefit. But if a commission could be appointed (if there is none in this city, it would be as useful to a large part of the State as at any other point, and as this board, or some competent member of the Farmers' club in this vicinity, who are probably acquainted with the country about, such an one ought to have the appointment to be of the most use in such a capacity. These cattle are mostly shipped here by rail that have these contagious diseases, and some one acquainted with their ways of shipping, etc., would be the most apt to get track of such animals.

I am truly yours, &c.,

H. N. CARGILL, Clerk.

The newspaper clipping enclosed by Mr. Cargill is as follows:—

THE CATTLE DISEASE.—Dr. A. Hunter, veterinary surgeon, has obtained several jaws of the diseased cattle condemned last week by the board of health. He has made an investigation into the disease and pronounces it "Ostea sarcoma," a species of cancerous ulcer. In an English treatise on the diseases of cattle, written by Drs. Francis Clater and Geo. Armatage, members of the Royal College of Veterinary Surgeons, the disease is mentioned as being hereditary, contagious, injuring the whole system and rendering the flesh unfit for food. The jaws that Dr. Hunter has are terribly diseased, the bones which in a healthy state should be only one-half inch thick are from four to five inches in thickness and filled with holes which contain virulent matter. He thinks that in the last stages, the disease amounts almost to blood poisoning.

A letter containing information of the diseased cattle at Grand Rapids, and of the action of the health authorities, being the substance of the foregoing letters from Messrs. Jones and Cargill, was sent to A. J. Murray, V. S., of Detroit, one of the cattle commissioners. The following is his reply:—

Dr. H. B. Baker:

DEAR SIR,—I received yours of 24th Oct., but had shortly afterwards to go to the country, which delayed me in acknowledging receipt of your communication. The disease which is described in your letter is one which I have not seen among Michigan cattle, nor among those coming from other States, and I saw a good many of both foreign and Michigan cattle while acting as inspector for the U. S. cattle commission. I incline to think it must be an enzootic disease, and that it is peculiar to certain localities. The assumption is hardly warranted that it is less common in the United States than in Europe, as very little has been written as yet on the diseases of American cattle.

A disease very much resembling that you mention is described in English veterinary works, but it is known that though they have given a tolerably correct account of its symptoms they have not understood the pathology of the disease. The real nature of the disease was first described by Bollinger, a Bavarian veterinarian, in 1877. It seems very probable that the diseased cattle which were brought to Grand Rapids were affected with this disease. It is a matter on which more light will be thrown, no doubt, by further investigation.

Very respectfully,

Detroit, 29 Congress St. E., 29th Oct., 1883.

A. J. MURRAY.

The disease from which the cattle suffered proved to be *actinomycosis*, a parasitic disease, most frequently affecting the jaw or some part of the head of animals and of man.

Information that such diseased cattle had also been shipped to Detroit from Chicago was received in the following letter from Dr. Wight, health officer of Detroit:—

OFFICE OF THE BOARD OF HEALTH, Detroit, Oct. 21, 1883.

Dr. Baker, Secretary State Board of Health, Lansing, Mich.:

DEAR SIR,—Oct. 24, Dr. De Wolf, of Chicago, sent me the following telegram: "A lot of twenty-three cattle left stock-yards this noon over the M. C. R. R., car number 7354, consigned to Webb Brothers, Detroit. Seven of them have malignant disease of jaws, and would be condemned as unfit for food if slaughtered here."

My meat inspector was on hand at the depot early next morning, found the cattle and followed them to pasture in the town of Greenfield, this county. I have ascertained the owner to be George Wineford, of this city, who has given me his word of honor not to dispose of the cattle in Detroit, but he claims the right to dispose of them elsewhere. I warned him that there is abundant law in this State against disposing of diseased cattle for food of man. As Greenfield is outside of my jurisdiction, I pass the matter over to the State board. I can only act as a citizen of Michigan, and not as health officer of Detroit, in this matter.

Very truly yours,

O. W. WIGHT.



On receipt of this letter from Dr. Wight the following circular letter was sent to the health officer of every township and village in Wayne county, and to a few localities in other counties where it was thought the diseased cattle might be sent:—

MICHIGAN STATE BOARD OF HEALTH,  
Office of the Secretary, Lansing, Michigan, Nov. 1, 1883. }

To.....

Health Officer of the township of.....

DEAR SIR,—I am informed that a car load of cattle, some having malignant disease of the jaws, were shipped to Detroit, and that several of the diseased cattle are now owned by George Wineford, and are in pasture in Greenfield township, Wayne county; and, as they cannot be slaughtered and sold in Detroit, there will probably be an attempt to dispose of them outside the city.

I trust you and your board will watch and prevent these diseased cattle from being sold for food in your township.

Very respectfully,

HENRY B. BAKER, *Secretary.*

Information relative to these diseased cattle in Wayne county was also sent to Veterinary Surgeon Murray, of the cattle commission. The following is his reply:—

Dr. H. B. Baker:

DEAR SIR,—I received your communication of 2d November. The board of cattle commissioners are prevented from taking any action in the matter referred to by you, in consequence of their having no funds at their disposal. I beg, however, to thank you for the information contained in your letter.

Very respectfully,

Detroit, 89 Congress St. E., 3d November, 1883.

A. J. MURRAY.

Concerning the final disposition of these cattle the following letter has been received from Dr. Wight, in answer to an inquiry from this office:—

OFFICE OF THE BOARD OF HEALTH, Detroit, Sept. 20, 1884.

Henry B. Baker, M. D., *Secretary State Board of Health, Lansing, Mich.:*

DEAR DOCTOR,—The cattle sick with actinomycosis did not come under my jurisdiction. We traced them to a point a dozen miles west of Pontiac, where they were slaughtered, and the precious beef was carted in the night to a steamboat and shipped up the river, probably for consumption in some interior town of the State.

I gathered evidence in every step of the case, except of the sale at the steamboat, intending to begin outside of my jurisdiction a State prosecution; but the attorney general informed me that the missing link in the evidence would be fatal.

The scoundrels were so hotly pursued that they will not be likely to repeat the experiment.

Respectfully yours,

O. W. WIGHT, M. D., *Health Officer.*

It is proper here to acknowledge with thanks the services of Dr. De Wolf, health commissioner of Chicago, in sending notice of the shipment of these cattle to the authorities of Detroit and Grand Rapids; and to request that under similar circumstances hereafter notice be sent not only to the health officer of the city to which the cattle are shipped, but to the State Board of Health, especially until such time as the State cattle commission shall be better equipped for work.

A necessity for an inspection of meat and of animals to be slaughtered for food is urged in the following letter from H. N. Cargill, clerk of the Grand Rapids board of health:—

OFFICE OF BOARD OF HEALTH, GRAND RAPIDS, MICH., January 28, 1884.

Henry B. Baker, *Secretary State Board of Health, Lansing, Mich.:*

DEAR SIR,—The question of diseased meat is now very prominent before the country, especially as regards foreign markets. I believe it will result in the end in a great benefit to the country, not only in matters of healthier meats, but also health to the inhabitants. There are no good reasons why the meat of this country should not be the most healthy in the world. As a general



thing the water of the country, the air, and the soil are free from the contaminations common to older portions of the globe. There is comparatively no restriction in this country as to the care and inspection of meat and animals, either when alive or after having been slaughtered. There is entirely too much liberty in this country in that respect.

For our own State, it seems to me that an inspector should be appointed in every township, to be appointed by the board of health of that township, who should inspect every animal in the jurisdiction, and the State law should be amended forbidding under a penalty any person selling or slaughtering any animal for meat until after it had been inspected (time before slaughtering should be stated in order to insure safety), and certificate issued that such inspection has been made, to accompany the animal when offered in the market for sale. Said local boards should have power to quarantine diseased animals whether of a contagious nature or not, until full recovery, or to dispose of the same effectually, to prevent communicating the disease to other animals; and for the safety of the public health there should be a penalty for failure to act. Compensation might be made to these inspectors at so much per head and mileage; or by State tax which, I believe, it ought to be, as it would be to the security of a large amount of property owned by the citizens of the State, as well as the preservation of their lives. The local boards of health should have the sanitary control over the care of all animals, as they now have over persons, in order to prevent their becoming diseased, and to keep them in as healthy condition as possible.

The law empowering a commission to be appointed by the Governor to look after contagious diseases in animals, in its present condition is of no benefit, as there is no power to enforce, and no compensation for services rendered, therefore no inducement to act. I believe if these suggestions were put in force it would prevent a great deal of rascality in dealing in diseased cattle and meat. It would weed out the diseased animals in the State, or give the meats of those States that adopt these regulations and strictly enforce them, a first-class reputation in the markets of the world. There may be additional regulations necessary.

I am very truly yours, etc,

H. N. CARGILL, *Secretary.*

That there is work for a commission on diseases of animals, to coöperate with local authorities in the prevention and restriction of such diseases; and that payment should be made for the expenses and services of such a commission, appears from the foregoing correspondence, and also from the following correspondence on glanders in horses:—

#### GLANDERS IN HORSES.

August 4, 1884, the following letter was received from Hon. S. M. Stephenson, of Menominee, giving information of glanders in Delta county, and enclosing the letter which follows it, from R. Peacock, of Bay de Noquette:—

*Henry B. Baker, Secretary State Board of Health:*

DEAR SIR,—Inclosed please find letter from R. Peacock, which explains itself. From other sources I learn of this disease among horses in locality referred to. Unless prompt measures are taken, the disease is very liable to spread over this entire section. Will you kindly take such action as in your judgment seems best in the matter? Yours very truly,

*Menominee, Mich., July 31, 1884.*

S. M. STEPHENSON.

HON. S. M. STEPHENSON,—Your letter of 16th came last week during my absence. The facts are these: Mr. Shatbanaw got a horse from some place last winter. It ran at the nose thick mucus. W. Wellstead bought the horse, put it with his 4; result—5 snotty horses, 2 dead, all the same snotty noses. George English lost several. Now, I have used all endeavors to have the State authorities take hold of the matter, but without success. Wellstead carries the mail, and carries also this rotten disease. From enclosed slip you will see that it has got a fair start, when if the State folks had listened to my cry last winter we might have stamped it out. My horses have been quarantined for six months against all comers, on account of this disease. Now, as to being glanders, I call it that; some say nasal gleet; but one or the other, it is spreading and kills the horses. So try and stop it, or we might as well hang up our fiddle. Try and get the board up, one of whose letters I enclose. Any further information call on me. Yours truly,

*Bay de Noquette, Delta Co., Mich., July 28, 1884.*

R. PEACOCK.

The newspaper clipping enclosed with the preceding letter is as follows:—

Geo. A. Doran, veterinary surgeon, well known in this vicinity, passing through town the other day, called at our office to say a word or two concerning the disease, glanders, which exists among the horses in portions of this and Schoolcraft counties. The word or two was to the point and was substantially this: That if the disease be not stamped out at once by the death of the

infected animals, and thorough disinfecting of all stables or other enclosures in which they have been kept, it will cost the county ten—yes a hundred times the value of such animals (in fact a glandered horse has no value) and the cost of the measures of safety. The time is now, before the winter comes and the conditions most favorable for the disease. He spoke also of the danger to human life from the disease; men engaged about diseased horses may take glanders themselves and be beyond the reach of medicine before they know that they are in danger. His declarations are in effect the same, as to the existence and extent of the danger, as those of persons, owners of horses in the northern and eastern townships, who have heretofore spoken and written to us on the subject, and unless they are all mistaken some energetic means should be taken promptly, to prevent the spread of the infection.

On receipt of these communications, letters were written to Messrs. Stephenson and Peacock for more definite information as to what townships had glandered horses. The following is Mr. Peacock's reply:—

*Henry B. Baker, Secretary of State Board of Health:*

DEAR SIR,—Your favor of the 9th is before me. My first letter was to the honorable Governor. Unanswered. Second do. was favored with a reply, both urging active measures to be taken by the commissioners under section 1742, C. Laws of 1871, one of whom replied he did not accept, the other, whose letter is before me, complaining that a certain Senator killed the bill in the Senate. So the commissioners are powerless. So much for the starter.

Now for the trouble. Last winter a certain horse owned by Mr. Scabanaw, sold to W. Wellstead of Brampton, Baldwin township, ran at the nose, a thick mucous matter, offensive. Wellstead had four other horses, all of which speedily became affected the same way. Wellstead carries the mail from Brampton to Manistique, and carried the contagion into Schoolcraft county. As soon as I saw the horse it made me afraid, and I remonstrated with Wellstead to no avail; hence this correspondence. The horses are mostly dead and to this trouble, perhaps, twenty have died. Last week one of the rotten horses passed me on the road, from whose nostrils the pus was running, and where it will end no one can tell, unless some active measures are taken to stamp it out. Do what you can to help us out. Am afraid the local board of Baldwin will not take hold of the matter.

Yours truly,

*Bay de Noquette, Delta county, August 11, 1884.*

R. PEACOCK.

On receipt of the foregoing letter from Mr. Peacock, the following letter, or one substantially the same, was sent to the health officer, or, where no health officer had been returned to this office, to the supervisor of each township in which there was believed to be a glandered horse; namely, to—

	Township.	County.	Postoffice.
<i>Health Officers—</i>			
Herman Winde.....	Baldwin .....	Delta .....	Brampton.
John Stark .....	Thompson .....	Schoolcraft..	Thompson.
<i>Supervisors—</i>			
James McGee .....	Nahma .....	Delta.....	Nahma.
Robert Peacock .....	Masonville.....	Delta.....	Bay de Noquette.
Wm. C. Bronson .....	Hiawatha .....	Schoolcraft..	Manistique.
Dr. Omer C. Bowen .....	Manistique .....	Schoolcraft..	Manistique.

The paper on glanders referred to in the letter is a reprint from that printed on pages 303-334 of the Report of the State Board of Health for 1879. The letter is as follows:—

MICHIGAN STATE BOARD OF HEALTH. }  
 Office of the Secretary, Lansing, Michigan, August 14, 1884. }  
 -----, Supervisor of -----.

DEAR SIR,—I am informed that glanders is present in your county and probably in your township, the horses of Mr. W. Wellstead, who carries the mail from Brampton to Manistique, being affected with the disease and having given it to other horses along the line of his travel; and the name and postoffice address of the health officer of your township not having been returned to this office this year, as required by law (although twice requested), I write to you as the president of the local board of health.

Glanders is an exceedingly dangerous disease, communicable to men as well as to animals, and there is great danger that the disease will spread in your vicinity and be communicated to persons, if prompt action is not taken for its extermination. I

trust your board will make a careful investigation, and if the disease is found among the horses of your township or passing through your township, that you will take prompt and vigorous measures for its extermination. For the local board not to act promptly in such case would be little less than criminal negligence. By this mail I send you a paper on glanders, in the last part of which you will find full directions for the extermination of this dangerous and fatal disease.

I shall be glad to hear whether you find the disease present in your jurisdiction, and also what measures you may take for its restriction and prevention. Enclosed please find stamped envelope for you reply. Very respectfully,

HENRY B. BAKER, *Secretary.*

The following replies to this letter have been received:—

*Henry B. Baker, Secretary State Board of Health:*

DEAR SIR,—Yours of the 13th inst. calling attention to the alleged existence of glanders or farcy amongst horses in this township was duly received. I proceeded at once to inspect some horses owned by Mr. Wellstead, the mail carrier. Judging from the description of symptoms given in the pamphlets sent me I think there can be no doubt that two, the number I saw, of Mr. Wellstead's horses have the glanders.

I called a meeting of the board of health. At this meeting the resolutions suggested in your pamphlet were adopted, in the main. Public notices giving the text of these regulations are now posted up in the township. The chairman of the board was delegated to interview the health officers of those townships east of here on the mail route in which the disease most likely exists, in order, possibly, to secure united action.

Until we secure the services of a competent veterinary, whose dictum would be taken as reliable and conclusive, it does not seem practicable to proceed to the destruction of the infected animals. Mr. W. will not submit to the destruction of any horse unless he is paid for it, and the town authorities don't deem it advisable to pay and make such a precedent. The people are thoroughly waked up to the danger and I think will compel the isolation of those animals.

I have given a special notice in writing to two horse owners, calling their attention to the resolutions adopted by the board and posted, and I stated also that "the board has reason to believe that the said disease is prevailing among horses in your charge." I handed Mr. W. one of the pamphlets.

The board requests me to ask you if in case no accredited veterinary surgeon can be obtained nearer, could such a person be summoned from your parts, and what the probable expense would be.

Very respectfully,

Brampton, Delta Co., Mich., August 21, 1884.

HERMAN WINDE,  
*Health Officer of Baldwin Township, Delta Co.*

*Secretary of the State Board of Health:*

DEAR SIR,—Yours of the 14th inst. came to hand this morning. Have made all possible inquiries all day in regard to horses being affected with glanders on Brampton and Manistique mail-route, without avail, until this evening, when I saw a man from Manistique who is keeping horses and livery, who told me that Mr. W. Wellstead has had a horse on the road which had symptoms of glanders, but might not be anything but a bad cold; that said Wellstead had taken said horse off the road and had sent another team; therefore I am at a loss to know whether the disease is really the glanders or not, but have put men on the *qui vive* in that respect, for we certainly do not want the disease to get here. Am very much obliged for informing me of same, and rest assured that we will do our best to prevent not only this but any other disease. Our country here as a general thing is very healthy, and even this summer as an exceptional hot one there is no disease so far except a few cases of summer complaint.

Respectfully yours,

JOHN STARK,

Thompson, Aug. 19, 1884.

*Health Officer of Township of Thompson, Schoolcraft Co., Mich.*

*Henry B. Baker, Secretary State Board of Health:*

DEAR SIR,—Your favor of 14th inst. received and contents noted. I am pleased to report that our township is, and has been, free from any contagious or infectious diseases for the past year, excepting one case of farcy, last June. The owners of the horse killed and buried him. Wellstead's horses that have been reported as having glanders have not passed through our township for some time. I don't believe that it is a case of glanders; notwithstanding, we have stopped the horses from coming here. Our township is in a very healthful condition, free from disease and sickness of contagious nature whatever.

Yours respectfully,

Nahma, Mich., August 21, 1884.

JAS. MCGEE, *Supervisor.*

*H. B. Baker:*

DEAR SIR,—Dr. Adelbert E. Burdick is health officer for this township. There is no glanders in this township or county, none whatever. Wellstead is in Delta county. Respectfully yours,  
Manistique, Mich., August 20, 1884.

O. C. BOWEN, M. D.



A letter was sent also to Prof. E. A. A. Grange, V. S., of the State Agricultural College, at Lansing, inquiring for what he would go to Brampton to diagnose the disease. The following is his reply, a copy of which was at once transmitted to Herman Winde, health officer of Baldwin township:—

AGRICULTURAL COLLEGE, 3d September, 1884.

Henry B. Baker, M. D., Secretary State Board of Health, Lansing, Mich.:

DEAR SIR,—I regret very much that my absence from home for the past few weeks has prevented my replying earlier to yours of the 23d ult. I presume it is too late to do anything in the matter now. I may add for information that \$10 per day and expenses is the usual charge in such cases.

Yours respectfully,

E. A. A. GRANGE.

September 3, 1884, the following letter was received from George T. Burns, of Escanaba.

Henry B. Baker, M. D., Lansing:

DEAR SIR,—I wish to call your attention to the fact that there are two cases supposed to be glanders in this township. The horses belong to a farmer named John Barron, Jr., and the attention of the local board of health has been called to the cases; but they think they have no power to act in the matter, etc. Will you be kind enough to call their attention to the matter and give them what instruction may be necessary for them?

Hon. S. M. Stephenson has sent me your letter to him of the 4th of August, and it is by his request that I notify you of the above cases.

Yours respectfully,

Escanaba, Mich., September 1, 1884.

GEORGE T. BURNS.

A letter similar to that on pages 10–11 was at once sent to Regis Beauchamp, health officer of Escanaba township.

The following letter was received in reply from Health Officer Beauchamp. The promptness of Mr. Barron in having the glandered horses killed when informed of the nature of the disease cannot be too heartily commended.

Henry B. Baker:

DEAR SIR,—I was to John Barron, Jr., to examine his horses. I found the horses very sick. I read your letter to Mr. Barron, and explained to him how it was. I started to call the board of health together. Before I came back he had the horses led into the woods and killed. I am not judge enough of glanders to say that it was the glanders, but it was supposed to be the glanders. You have stated in your letter that you sent me a paper on glanders, with full directions for the extermination of this dangerous and fatal disease; but I did not find it. Please send one of those papers. I would be very glad to get one.

Yours truly,

Escanaba, Michigan, September 19, 1884.

REGIS BEAUCHAMP, Health Officer.

It is proper in this connection to refer also to a report of glandered horses in Clinton county in 1880, on pages liii–liv of the Report of the State Board of Health for 1881; also to glandered horses in Shiawassee county in 1881, concerning which James S. McBride, of Burton, justice of the peace of Owosso township, Shiawassee county, wrote as follows, under date of March 31, 1881:—

The glanders has broken out in our neighborhood. There have been four horses shot and there are some more that have the symptoms, and the parties are not careful with them as we feel they should be. There was a car load of horses brought from Ohio about a year ago, which seems to have been the cause. Please write the law and all necessary instructions, and whether you can appoint some suitable person to look after the matter. Write soon. Respectfully yours,

JAMES S. MCBRIDE, Justice of the Peace.

No sickness of men from glanders in Delta or Schoolcraft counties has yet been reported to this office. In May, 1879, a man died from glanders in Wayne county; and in August, 1879, a man died from glanders in Oakland county. Each of them had cared for a glandered horse. Reports of these cases, by Drs. Duffield and Post, are printed on pages 304–307 of the Report of the State Board of Health for 1879. It is not uncommon for a person to take glanders from a horse, and most cases of glanders in man are fatal. The danger to the public health, as well as the safety of other animals, demands



the destruction of every glandered horse. Delay increases the danger. Considerations of economy and of health urge to prompt action.

The local board of health can employ the services of an inspector of meat whenever they deem it necessary. They can enforce the State law against the sale of diseased meats for food.—Section 7726 Compiled Laws of 1871, § 9316 of Howell's Annotated Statutes. By judicious inspections and prosecutions they can prevent such sale. They can also secure an inspection of all animals within their jurisdiction whenever they think that necessary. They can order and enforce the isolation of diseased animals. They can, on complaint and proof before the circuit court, secure the destruction as a nuisance of a diseased animal, liable to communicate a dangerous disease to man, or liable to communicate to other animals such disease dangerous to man. While in some cases it may seem desirable that there should be greater authority for a summary destruction of diseased animals, such destruction can be secured on proof of its necessity, by the courts. And the necessity which should require a summary destruction of diseased animals as a protection to the public health, would justify that destruction; but such necessity can often be more easily proved before than after the destruction of the animal. Of course there are also considerations of property which may require the destruction of diseased animals, simply as a protection to other animals, considerations which a court would entertain; but it is the danger to public health from a communication of disease to man or from the use of the diseased meat as food with which the board of health is concerned; and in every case the power of the local board of health is as great as the danger. It is their duty and they have the power to do what is necessary to protect the public health; and while they are subject to the rule that property is not to be destroyed without due process of law, they are in a limited sense the judges of what is necessary to be done.

Concerning the power of a local board of health in Michigan to destroy a glandered horse, LeRoy Parker, Esq., of Flint, in 1879 a member of the State Board of Health and its committee on legislation in the interests of public health, expressed the following opinion:—

"The question has sometimes arisen whether animals affected with a contagious disease may be summarily destroyed. The general rule seems to be that so long as the owner restrains the animals upon his own premises, no person has the right to kill them; but if they are suffered to go at large, or if they escape from the owner's custody, the owner of the premises upon which they escape, may kill them if necessary for the protection of his own animals.\* In the case of horses affected with glanders, which is recognized as an incurable disease,† and one which may communicate all its loathsomeness and fatality to human beings, there is no question but what a board of health would be protected in destroying them wherever found, after due notice to the owners, if in their opinion it was necessary for the public health. This protection, however, would only be afforded in case the disease was actually the glanders."

In the hope that by calling attention to the necessity for prompt suppression of contagious diseases of animals in Michigan, and for a provision of means by which the cattle commission can do its proper work, it may serve the interests of the public health in Michigan, the foregoing correspondence is respectfully submitted.

HENRY B. BAKER, M. D.

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\* Wood's Law of Nuisances, Sec. 837. † Hanover's Law of Horses, p. 76.

## SANITARY CONVENTION AT LONDON, ONTARIO, DECEMBER, 1883.

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REPORT BY ARTHUR HAZLEWOOD, M. D., OF GRAND RAPIDS, MICH., MEMBER OF THE STATE BOARD OF HEALTH.

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GENTLEMEN,—As your delegate I attended the sanitary convention held in London, Canada, under the auspices of the Provincial Board of Health. The meetings were held the first day in the city hall and were very well attended. As an illustration of the purity of the water-supply of the city a small fountain was displayed upon the platform. The sessions of the American Public Health Association holding over so late, we were unable to reach London in time for the first session held during the forenoon.

The afternoon session was promptly opened, Judge Elliott leading off with a paper, not strictly belonging to sanitary science, explaining the difficulties judges have in cases where insanity is set up as a plea for the defense; alleging that medical experts have not yet defined insanity in any such formula as can be satisfactorily presented to a jury, and excusing judges from injustice when they omitted to charge juries that in the event they considered the prisoner to be laboring under an uncontrollable impulse they should acquit, as opening wide the door to many vagaries so that no line could be drawn, and all crimes might be said to be the result of an uncontrollable impulse.

The next paper was on the "Results of London West Flood," by Prof. W. Waugh, M. D. London West during the early summer was visited by a severe flood. The land lying low, the houses were flooded with water, carrying with it an immense amount of bad smelling matter, presumably the contents of privies, cesspools, and other foul-smelling receptacles of filth. Some 400 houses were thus rendered uninhabitable, and the problem was, What to do? The board of health decided to give all the assistance in their power to those who returned to restore their homes, and by drainage and disinfectants to improve the general condition of the village as quickly as possible. Several large pools of stagnant water were at once drained and chloride of lime was sprinkled over the surface; the deposit was removed from the streets, the refuse was collected in heaps, covered with tar and burned; in most of the houses the deposit was at once removed, the floors and walls washed, fires kept going and disinfectants freely distributed. The inundated district was divided into localities, each under the charge of a physician, so that thorough inspection could be maintained; and by paying a small sum as an incentive, the cellars were properly cleansed. By these means in a few days the houses were again habitable, and in a month the sanitary condition of the district was better than before the flood.

Mr. J. K. Allen, of Chicago, read the next paper on "The Province of Sanitary Journalism," claiming for sanitary journals the conversion of a large

class of tradesmen from ordinary plumbers into sanitary plumbers, also that it has created a new profession—that of sanitary engineering, etc.

J. L. Bray, M. D., then read a paper on "Malaria," giving the causes— included under the heads of heat, moisture, and vegetable decomposition,—and recommending drainage, planting of forest trees, and supplying good water as a means to prevent its spread.

At the evening session a paper on "Effects on Public Health of Mill-dams," elaborated the paper of the afternoon on malaria, which was followed by papers by Mr. Galbraith, C. E., and Dr. Oldright on sewers and sewerage—both emphasizing the necessity of thorough construction and proper ventilation of sewers. Dr. Ezra Hunt then made a few remarks dilating upon the necessity of sewers and other sanitary appliances.

Dr. P. H. Bryce followed with a paper on "Local Health Organizations," calling attention to their necessity and advocating the employment of a competent health officer at a proper salary.

Saturday's sessions were held in the court-house, a much more comfortable and otherwise pleasant building. The attendance was good, and largely made up of school teachers. The able paper of Prof. Saunders, omitted the evening before, was read, and elicited some discussion. The paper was a résumé of articles generally used for disinfection, with comments on their value.

J. Dearness, Esq. read a very interesting paper on the Hygienic Condition of Rural Schools, giving mainly the result of his observations in Middlesex county, where he is inspector of schools, from which it would appear that few or none of said schools are in a hygienic condition. Either they are uncleanly or not properly heated or ventilated, or over crowded, or have insufficient or otherwise defective out-houses. He showed by samples the water supplied for drinking-purposes, which when tested with permanganate of potash showed much impurity. He gave some excellent remarks on proper age for children to begin attending school, etc.

The afternoon session was called to order promptly.

Dr. Campbell read his paper on Infective Diseases in Schools, pointing out the necessity of isolation and proper permits before pupils who have been sick of infectious diseases can return to school, etc.

Dr. Bryce began his paper on Why so many Persons die of Consumption, showing by statistics that the disease is more prevalent in cities than in rural districts. As it was necessary for him to leave for home, he requested that some other person read the balance of his paper. Prof. Saunders essayed to do so, but finding it to be very voluminous and hard to read, it was omitted. Some resolutions followed and the convention adjourned. On the whole the convention may be considered a success.

By the courtesy of some of the residents of London I was enabled to visit the water-works and sources of water-supply. The latter prove to be several ponds situate on a hillside, in part artificial so as to increase storage capacity. These are some tens of feet above the river and are supplied from perennial springs. The water flows into a well, from which it is pumped to a reservoir, still higher above the river. They have two engine-houses, one supplied with power by a water wheel moved by the river, the other a steam-engine. The quality of the water is unexceptionable.

A. HAZLEWOOD.



## CONFERENCE OF EXECUTIVE OFFICERS AND OTHER REPRESENTATIVES OF STATE BOARDS OF HEALTH.

BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

*To the President and Members of the Michigan State Board of Health :*

GENTLEMEN,—As your delegate I attended the meeting of representatives of State Boards of Health in Washington, D. C., May 7, 1884. The purpose of the meeting you well know, but it may be briefly recited as follows, namely, A conference of duly appointed representatives of State Boards of Health, respecting the practical affairs of everyday work, especially the work of the executive officers of the Boards, with the view that each Board may profit by the experiences and suggestions of the others, and that by comparisons of views the teaching of theories and methods of procedure for the lessening of diseases which endanger the public health may be more uniform, and not contradictory as has sometimes been the case; the call issued by the committee indicated that “whenever the health authorities of all the States shall meet, discuss, and agree upon the course they will pursue with respect to yellow fever, cholera, scarlet fever, small-pox, diphtheria, or any disease which endangers public health without regard to State lines or borders, and whenever all State Boards shall act in concert, considerable progress will have been made in solving the problem of what are the best methods for national action in regard to inter-State and maritime quarantine, or inspection and disinfection, as well as in the practical control of epidemic diseases within the several States of this country.”

The meeting was well attended, the delegates and others present being as follows:—

Dr. J. N. McCormack, Sec'y Kentucky State Board of Health.	Dr. E. S. Elder, Sec'y Indiana Board.
Dr. C. C. Fite, Sec'y Tennessee Board.	Dr. J. E. Reeves, Sec'y West Virginia Board.
Dr. C. W. Chamberlain, Sec'y Connecticut Board.	Dr. Jerome Cochran, Sec'y Alabama Board.
Dr. E. M. Hunt, Sec'y New Jersey Board.	Dr. Henry B. Baker, Sec'y Michigan Board.
Dr. J. C. Hearne, Sec'y Missouri Board.	Dr. H. P. Walcott, of the Massachusetts Board.
Dr. Chas. H. Fisher, Sec'y Rhode Island Board.	Dr. C. V. Tyler, of the Michigan Board.
Dr. Chas. N. Hewitt, Sec'y Minnesota Board.	Dr. J. B. Lindsley, and Dr. G. B. Thornton, of the Tennessee Board.
Dr. John H. Rauch, Sec'y Illinois Board.	Dr. C. A. Lindsley, of the Connecticut Board.
Dr. F. W. Hatch, Sec'y California Board.	Hon. Erastus Brooks, of the New York Board.
Dr. Irving A. Watson, Sec'y New Hampshire Board.	Dr. G. P. Conn, of the New Hampshire Board.
Dr. Thomas F. Wood, Sec'y North Carolina Board.	Dr. G. M. Reynolds, of the Iowa Board.
Dr. R. J. Farquharson, Sec'y Iowa Board.	Dr. Stewart, of the Maryland Board.
	Dr. Stephen Smith, of the National Board of Health.

By invitation of those who had moved for this organization, the discussions were opened by persons who had not given the subject much attention, but



whose opinions it was considered important to have presented, consequently the discussions took a very wide range, and considerable opposition developed because, apparently, of a misunderstanding of the purposes of the proposed organization, and a jealous feeling on the part of some who have labored hard to make the American Public Health Association fulfill all the purposes for which union of sanitarians in this country is desirable. After a free comparison of facts and views, it was finally agreed by the meeting that "There shall be a conference of executive officers and other representatives of State Boards of Health during the meetings of the American Public Health Association, and at other times if desired. All questions arising in such conference shall be determined by votes by States, each State being entitled to one vote. The officers shall be a chairman and secretary."

The purposes of the meetings of the organization are, as this Board understands, such as cannot profitably be discussed in open meetings of the American Public Health Association, or in any other association except of the officers engaged in our work, being the comparison of the experience and information otherwise gained by the executive officers and other members of State Boards of Health, in their work which differs very materially from the work of municipal or other local boards of health, and requires knowledge and skill in a new and comprehensive branch of *social science*, as well as thorough knowledge in the several branches of *sanitary science* and practice.

So much time was taken in the discussion of the need for such organization for the common good, and so much effort of one or two members to confine the work to impromptu and therefore crude expressions of ill-digested ideas, that there was no opportunity for the presentation of the papers and other material which had been carefully prepared by several delegates, in accordance with the request of the committee charged with the duty of preparing for that meeting. However, in the little of this which was presented by Dr. Farquharson, of Iowa, and one or two others, there was much promise of usefulness in this direction in future meetings.

The unprofitable subject of how much of sanitary progress is due to the "lay members" and how much is due to physicians, was brought up, as usual, just before the election of officers, and resulted very much as in the old story of the meeting of the hands and other co-ordinate members of the clock. So far as the attendance at that meeting was evidence of the relative familiarity of the two classes with the work of State Boards of Health, it showed a preponderance of doctors, there being only one delegate present who was not a physician.

The officers for the ensuing year are Hon. Erastus Brooks, *President*; Dr. J. N. McCormack, secretary of the Kentucky State Board of Health, *Secretary*. It was understood to be the duty of the secretary to lay out the work for the next meeting, and to act in general as the executive officer of the organization.

The next meeting is to occur at St. Louis, Mo., at the time of the meeting of the American Public Health Association.

The resignation of Dr. Fite as Secretary of the Tennessee State Board of Health, since the Washington meeting, has reminded me that, in our informal conferences there, three or four of the most active and prominent secretaries, Dr. Fite being one of them, told me they thought of resigning, and alleged that they could not longer sacrifice their own personal interests in a pecuniary way, that they had labored hard for the establishment of the work in their

States, and had undertaken to show some of the things that might be done, but their own compensation was not such as to induce them to remain in the work, and that rather than labor to have it increased, they would resign and resume the practice of medicine. If many such men act thus, there is a prospect of a lowering of the standard of the workers in the public health service. It seems to me that for the general good it is to be hoped that those States will act more like the State of Michigan, and by providing reasonable compensation, retain their present capable officers.

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## EXAMINATION OF PUBLIC BUILDINGS.

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REPORT BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

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Section 2 of Act 81 of 1873 directs that the State Board of Health “shall, when required, or when they deem it best, advise officers of the government, or other State boards, in regard to the location, drainage, water-supply, disposal of excreta, heating, and ventilation of any public institution or building.”

December 22, 1883, a communication was received from the secretary of the State Board of Corrections and Charities, transmitting a resolution by that Board requesting the State Board of Health to examine the sanitary condition of the county jails in Jackson, Washtenaw, Van Buren, and Barry counties, and the poor-house and asylum for the insane in Wayne county. The resolution is as follows:—

“*Resolved*, That the State Board of Health be and they are hereby requested by committee or otherwise to visit the jails in the counties of Barry, Jackson, Van Buren, and Washtenaw, and the poor-house and asylum in connection with the same in Wayne county; and to examine the same in reference to their sanitary condition, and to report to this Board.

“*Resolved* further, that the said State Board of Health be requested to endeavor to enlist the local boards of health in the several counties above named in securing better sanitary conditions in said institutions.”

At the regular meeting of this Board, January 8, 1884, committees were appointed to make the examinations requested; and it was voted that a prominent citizen of each locality where an examination is to be made be requested to aid in the examination. The following members of the Board were appointed such committees:

For the Jackson county jail, Drs. Vaughan and Kellogg; for the Washtenaw county jail, Drs. Kellogg and Vaughan; for the Van Buren county jail, Drs. Hazlewood and Kellogg, with Dr. Baker as alternate if either could not attend; for the Barry county jail, Drs. Avery and Hazlewood; for the Wayne county poorhouse and asylum, Drs. Lyster and Tyler.

Before the committee were able to examine the Van Buren county jail, it had been condemned by the circuit judge. The reports of the other examinations have been submitted to the Board of Corrections and Charities. They follow herewith in the order in which they were made.

## EXAMINATION OF BARRY COUNTY JAIL.

REPORT BY JOHN AVERY, M. D., OF GREENVILLE, AND ARTHUR HAZLEWOOD, M. D., OF GRAND RAPIDS, COMMITTEE OF THE STATE BOARD OF HEALTH.

REV. GEO. D. GILLESPIE, D. D., *President of State Board of Corrections and Charities*:

SIR,—In accordance with the request of the State Board of Corrections and Charities, a committee from the State Board of Health, consisting of Drs. John Avery and Arthur Hazlewood, visited the Barry county jail on the 28th day of February last. The committee arrived in Hastings about 7 o'clock in the morning, and through the kindness of Walter S. Wilkins, was introduced to the following gentlemen: Rev. J. W. Bancroft, Dr. Wm. E. Upjohn, and J. H. Dennis, of the Hastings Banner, all of whom accompanied the committee through the jail. At the jail we found Mrs. J. G. Cressey, wife of the sheriff, who showed us every courtesy and in every way most cheerfully aided us in the examination.

The building is an old two-story brick, built some thirty years ago. The first floor is occupied by the sheriff and his family; the second story as the jail proper. This floor is reached by very narrow, steep stairs, the landing of which is about two and one-half by three feet,—being the space between the grated end of the main hall and the cell designed for the use of female prisoners. A hall seven and one-half feet wide runs through the center of the building north and south. Upon the west side and opening from it are three cells,—two eight and one-half by eight and one-half feet, and one five by eight and one-half feet, the latter dark. On the east side of the building is a narrow passage way some two and one-half or three feet wide, and opening from it on the west are two cells six and one-half by five and one-half feet, both dark. At the north end of the main hall, and separated from it by the narrow passage described as the landing to the stairs, is a cell about eight by eight feet, designed to be used for the confinement of female prisoners. This cell is in plain view of the main hall, occupied by the men during the day, with nothing to prevent conversation between the occupants of the two. There is no provision for warming this cell; but in one corner there is a seat and an opening directly into the privy-vault, situated just outside the north wall of the building. On the opposite side of the partition wall is another seat and opening, for the use of the occupants of the hall, and in like manner communicating with the privy-vault. There is no trapping of any kind in the open shaft leading from these seats to the vault, nor is there any water for use in it.

An old privy-vault, in use for twenty years, is located under the south end of the building. This was filled up when the new vault was made about six years since. The old well and the old vault were within fifteen feet of each other. The new well, now in use, is located some eight or ten feet from the barn and between it and a compost heap about thirty feet distant, and within thirty-five feet of two privy-vaults. The well is about thirty feet deep.

The jail is warmed by means of a hot-air furnace, located in the basement.

A wooden box, designed for the admission of fresh out-door air to the hot-air chamber, was closed on the day of our visit, but between the slide and the hot-air chamber, the box was sufficiently open to admit plenty of air from the dark and unventilated basement. The heated air is carried by means of a tin pipe to an opening near the center of the main hall. Around this opening



the men sit during the day, reading or playing cards, smoking and chewing tobacco, and using the opening as a convenient spittoon and a place in which to deposit their exhausted tobacco quids. There is not the slightest attempt at ventilation in any part of the building; and when the warm air comes up from the dark and unventilated basement, laden with the fumes of vaporized tobacco quids and the expectoration of diseased lungs, and mingles with the exhalations of eight or ten not over-clean prisoners and the gases arising from the privy-vault, the stench must be simply intolerable.

No argument is needed to add to the force of the simple statement of the condition of this jail. That a county of thirty thousand inhabitants, intelligent, humane, and rich, will long tolerate such a place for the confinement of unfortunate human beings, after public attention is once called to it, the committee cannot for a moment believe.

This jail was built when the county was new and poor. It has proved a safe place (and this, in fact, is its only merit) for the confinement of criminals and suspects, and beyond this the people have probably given it very little thought; but when their attention is called to its true condition and positive unfitness for the purpose for which it is designed, the committee will do the people of that prosperous county the justice to believe that both their pride and humanity will lead them to demand of their county legislators at least a decent place for their sheriff and his family to live, as well as for the confinement of their criminals.

*Greenville, Mich., March 12, 1884.*

JOHN AVERY,  
ARTHUR HAZLEWOOD,  
*Committee.*

## EXAMINATION OF WASHTENAW COUNTY JAIL.

REPORT BY J. H. KELLOGG, M. D., OF BATTLE CREEK, AND VICTOR C. VAUGHAN, M. D., OF ANN ARBOR, COMMITTEE OF THE STATE BOARD OF HEALTH.

MICHIGAN STATE BOARD OF HEALTH, }  
*Battle Creek, Mich., April 8, 1884.* }

### *State Board of Health:*

GENTLEMEN,—Your committee, accompanied by Dr. W. F. Breakey, and Dr. George, president of the city board of health and city health officer, visited the jail at Ann Arbor, February 5th, 1884.

The jail is a two-story structure, the front portion of which is occupied by the jailer and his family. The quarters for male prisoners consists of two tiers of cells opening into a corridor which extends around three sides of the rectangular portion of the building occupied by the prisoners. The first feature of the place which attracted particular attention was the foul odor which was plainly perceptible as soon as the door leading into the prisoners' quarters was opened. The sheriff stated that the odor was sometimes so offensive as to be absolutely intolerable. At the time of our visit the jail was occupied by only four or five prisoners; but we were informed that frequently thirty or forty were confined at once, although the accommodations were only sufficient for a much smaller number.

The water-closets we found located at one corner of the prisoners' quarters, opening directly into the general corridor. A more ingenious arrangement for producing unsanitary conditions of the worst sort could scarcely be devised



than that adopted in the construction of the water-closets connected with this jail. From the bottom of the shallow vault a sewer-pipe leads to the bank of a creek running in the rear of the jail, a few rods distant. The sewer-pipe runs out of the ground about two feet above the surface of the water. As a natural consequence, in the winter time the outlet becomes obstructed with frozen excrement, allowing the sewer to become choked. When the vault becomes filled up the outlet is thawed out and the accumulations drawn out. The sheriff remarked that on one such occasion the man employed to remove the obstruction built a fire at the outlet of the sewer for the purpose of thawing it out. On returning after an absence of a few hours and entering the prisoners' quarters, the jailer found them nearly suffocated with the smoke which had ascended through the sewer-pipe. This fact was sufficient evidence of the dangerous character of the contrivance, which was by the originators undoubtedly considered a very ingenious and labor-saving arrangement.

On looking about for means provided for ventilation, we found the only regular provision for air-supply was through this same sewer-pipe, by way of the filthy vault, into the corridors. Whenever the windows were open, unless the wind happened to be blowing toward the open windows with sufficient force to drive the air inward, there must of necessity be an in-going current of air from the sewer up through the vault. In the summer-time the foul air of the vault is undoubtedly driven into the corridors through the sewer, whenever the wind happens to be in such a direction as to strike the mouth of the sewer.

On entering the women's quarters, on the second story, we observed at once the same foul odor so noticeable below, and on investigation found that the privy accommodations were in direct communication with those of the men below, the same vault being used for both, and the anemometer showed that a strong current of air was constantly ascending into the women's quarters, from the men's quarters, being drawn down through the privy seats of the men's closets, through the vault, and thence upward through the upper water-closets into the women's quarters, thus furnishing the female prisoners, when any such were so unfortunate as to be confined in this pestilential place, a doubly contaminated air as their fresh-air supply. The opening of a window on the side of the house away from the wind was sufficient to establish a strong current into the room in the shaft leading to the common vault. Taken together, the arrangements of this jail seem to be the most perfect possible for securing an unsanitary condition of the most aggravating character.

If the county jail of Washtenaw county does not afford the jail physician a liberal amount of professional business, it must be attributed to hardness of constitution on the part of the inmates, rather than to the absence of adequate causes for disease.

The attention of the county authorities has previously been called to the unsanitary conditions of this jail at various times, and particularly by Dr. W. F. Breakey, who was physician to the jail for the year 1883. We quote the following from Dr. Breakey's report to the board of supervisors, dated October 12, 1883, a certified copy of which he very kindly furnished us:—

The diseases most prevalent have been intermittent, remittent, and other forms of malarial fevers, rheumatism, bronchitis, pneumonia, tonsillitis, diseases of the genito-urinary organs, and diarrhea, together with some minor cases of illness and injury. Fortunately no case of contagious disease has occurred though there have been numerous cases of diseases more or less communicable. Between fifty and sixty visits to these cases were made, frequently prescribing for and dispensing medicine for several patients at each visit.

Though perhaps all I can tell you as to the insanitary condition of the jail is well known to most of you yet I should feel that I neglected a public duty as well as an opportune occasion to

strengthen public opinion upon the need for some marked change for the better if I did not urgently call attention to this subject, which, to speak of it in no other light (I do not propose to consider the moral and humanitarian aspect of the question), is inseparable from the question of sickness and medical attendance.

That there is not more sickness is probably due to the short time that most of the prisoners are confined at one commitment and to the efforts of the authorities in charge to disinfect as thoroughly as practicable, and destroy germs of endemic disease before they can become active. In the lower or men's ward it is next to impossible to keep the air at all pure at the best, and it is sometimes so foul as to be sickening, particularly when it is crowded as it often is, when too cool to have the windows open.

There are no hospital facilities, not even a room to which a prisoner taken sick in this place can be removed or in which a case of suspected or contagious disease can be isolated or in which youthful offenders can be separated from those hardened in crime; and it is seldom that the women's ward above is available for such purposes. I do not wish to be understood as having a morbid sympathy with law-breakers, such as would provide them better quarters and living than are possessed by the average citizen who has to support them in idleness (on the contrary I would advise for the convicted prisoner and the "tramp" clean and wholesome but very plain and simple food); but I believe the law only contemplates in confinement of a prisoner security for appearance when wanted, or punishment for offenses committed. The sentence does not add exposure to a sickening atmosphere or to communicable disease.

Innocent and cleanly persons may sometimes be so unfortunate as to be confined in jail; as frequently are insane persons, for security until they can be sent to asylums. And whether it be law it would seem to be justice that a healthy man confined in a county jail, who should become disabled by a preventable disease contracted there, would have a claim for damages.

One other matter of opinion which to me seems important I give for what it is worth, that is if some plan could be devised whereby the great number of lazy vagrants and "tramps" now resorting to the jails of the State as a winter quarters *could be made to work ten hours a day*, in my opinion it would do more to break up the vagabondish, demoralizing lives of the average young, hale, hearty, able-bodied "tramps" who contribute the largest quota to our jails in winter; and if it did not make them wholly self-supporting or even materially lessen the cost to honest, industrious taxpayers who now support them, they would at least be forced to some healthy industry and on getting out might prefer to work elsewhere for themselves rather than to work in jail for the county. An honest, industrious tramp looking for work would prefer to work that way for board until he could find employment rather than be idle in the sickening atmosphere of a crowded jail.

Lastly, should this board consider the project of building a new jail, I would suggest from a sanitary point of view that provision be made for good ventilation, plenty of good water, privies and closets so disconnected from jail wards as to render infection from that source impossible, and, in the absence of sewerage, dry-earth closets instead of vaults, a hospital room for separation and care of ordinary cases of illness, and another room for the isolation of suspected cases of infectious disease and of such as may be communicable.

Very respectfully,  
W. F. BREakey.  
J. H. KELLOGG,  
V. C. VAUGHAN,  
*Committee.*

All of which is respectfully submitted.

## REPORT OF A SANITARY INSPECTION OF THE WAYNE COUNTY ALMS-HOUSE AND WAYNE COUNTY ASYLUM FOR THE INSANE, MADE BY A COMMITTEE OF THE STATE BOARD OF HEALTH, MARCH 22, 1884.

BY HENRY F. Lyster, M. D., CHAIRMAN OF COMMITTEE.

The committee have the honor to make to the State Board of Health the following report of a sanitary inspection of the premises mentioned in the heading, situated in Wayne county, west of Detroit twelve miles, on the line of the M. C. R. R., and midway between the villages of Dearborn and Wayne. The committee was accompanied by Hon. L. L. Barbour, of Detroit, member of the State Board of Charities.

The almshouse consists of a two-story brick building with basement, 46 feet by 36 feet, for offices for superintendent of almshouse, and for dining-

rooms, parlors, and living and sleeping rooms, and kitchen for superintendent and family and matrons and servants of the almshouse. This building is immediately connected by a covered way with the main building for the inmates. The main building is L shaped and is three stories in height, each of the two rectangles being about one hundred and thirty feet in length by about thirty-eight feet in width. These buildings face the south. The ground is gently rolling, and is a gravelly clay loam with more or less sandy loam, and is an open country. It is on the edge of the drift hills which extend from Oakland into Hillsdale county. The south branch of the river Rouge runs in an easterly direction through the north end of the large farm and affords an excellent drain for the sewage from all of the county buildings. A large glazed crock sewer, eleven inches in diameter, runs from the almshouse into this creek. Three twelve-inch oval brick sewers carry off the sewage from the asylum into the same branch. All of these sewers receive storm water from the roofs of the main buildings.

The water-supply is from a spring in a sand-hill, three-fourths of a mile away towards the south and higher than the site of the county buildings. The spring has been rendered largely productive by laying tile drains radiating from it like the spokes of a wheel, deeply set in the sand. The water which is of moderate quantity but of good quality, is received through an iron pipe into a brick reservoir sunk as a well midway between the almshouse and asylum for the insane, or about eight rods from the buildings. An artesian well about one hundred and sixty-four feet in depth has been recently bored and water said to be of good quality rises to within four feet of the surface, and flows into a brick cistern in the immediate vicinity of the other reservoir. The spring and well together yield an abundant and wholesome supply of water at all times and seasons, uncontaminated by any surface drainage or decomposing material. A hot-air engine of one and one-half horse power pumps the water into an elevated tank capable of holding six hundred barrels, from which it is distributed through pipes to all stories of the two buildings. The hot-air pump can raise the water to the elevated reservoir at the rate of one thousand gallons per hour, at an expense of about twenty-five cents per day for fuel. The cost of the engine and pump was about \$350. An additional elevated tank is desirable in case of repairs being required upon the one now in use; or in case of fire, to give a large and immediate supply. In these two most important matters in a sanitary point of view, namely, good water and good sewerage, nothing but favorable criticism can be made. When we come to consider other important factors in the production of diseases, which do predominate, the limited sickness and mortality must be naturally inferred as due largely to the good water and the adequate drainage and sewerage.

At the time of our inspection, there were present five hundred and nine (509) men, women, and children in the almshouse (361 men, 113 women, 35 children), exclusive of officers and attendants who number about a dozen. At the asylum for the insane there were two hundred and ten (210), and nine attendants.

Upon inspecting the buildings at the almshouse, the women's hospital and wards were first visited. It consists of a large rectangular three-story brick building, facing the south (88 feet by 40 feet) and is directly north of the officers' quarters. A hall divides the first story, running north and south across it. The first ward to the right on first or ground floor is a ward for women, 40 by 38 feet, with ceiling 10 feet high. It contains 21 single beds; 16 women and two infants were in this room, and the beds were all occu-



pied at night. It was found to be well lighted by a row of windows of good size on each side, about 16 in number, and was warmed by a stove. The east end was divided into two wards, also for women, each about 24 by 16 feet, and eight feet to ceilings; one contained 8 beds, and was occupied by 8 women and one infant; and the other contained 9 beds and was occupied by 9 women and 2 infants. On the west side of the hall was a dining-room, 15 by 30 feet, and 10 feet in height. The dinner which was being served appeared to be wholesome and nutritious, and very good soup and excellent bread were on the table. The bread, made in the bakery of the institution, of a very good quality of flour in which the whole grain, except the bran, was used, is excellent in quality and seemed to be used in sufficient quantity.

Four lying-in wards were opposite the dining-room, each 12 by 15 feet, with 10 foot ceilings. There were four single beds in each ward. There was a large window and door in each ward. The beds in these wards were all occupied at night, although there were no puerperal women in the hospital at the time of the inspection. Dr. Bennett, the physician of the asylum and almshouse, had attended this hospital for about three years, and had assisted at 150 confinements but had not had a case of puerperal (childbed) fever during that time.

A hospital dispensary was next the dining-room and was of the same size as the wards for lying-in women.

The second story was divided the same as the first floor, and the ceiling is the same in height. Thirty-nine single beds were arranged around the walls and at the east end. Thirty-nine women and one child, five years of age, an epileptic, occupied this ward, which was well lighted by half a dozen large windows on each side. West of the hall on this floor were seven rooms and a hall. One of these rooms was used for a school and was fitted up with school desks and seats, blackboards, etc. School was held each day, according to a report of the superintendent of the almshouse. Seven women occupied the rooms, which were nicely fitted up, and intended for a more respectable class of elderly women than are ordinarily found in poor-houses.

The third floor was intended for the children's ward or nursery, and was 60 by 38 by 9 feet; there were 34 beds in this ward; 25 women and 24 infants or young children were in the ward. It was well lighted by plenty of large windows on each side and was heated like the two other large wards on the lower floors, by a large stove in the center of the room. The western portion of this floor was not connected in any way, but belonged to the men's department and was occupied by men, who were received into it from the other stairs in the northern part of the building.

On the first floor of the large rectangle belonging to the male department, running north and south and at right angles with the women's ward, is the hospital for men, 78 by 32½ by 12 feet, a very large ward indeed. Twenty-seven patients were in the hospital, but only four sick enough to be confined to their beds. These four were very old men with chronic bronchitis and anæmia. The large stove in the center of the room had a pipe enclosed with a jacket, intended to produce a current of warm air which was to aid in ventilation of the ward. It was really of some service but quite inadequate to the work. The idea was a good one so far as it was possible to carry it into effect by one pipe.

The bath room with two tubs was in the north end of this ward and the water closet in the same vicinity connected with the sewer. The facilities were quite insufficient for the proper bathing of the inmates, provided the bath was used for its moral and sanitary virtues.



On the second floor in a ward 56 by 32 by 10 feet, were 47 beds and 32 bed-ticks on the floor; all the beds and ticks are used at night,—old men's ward. The second floor north end ward, 26 by 20 by  $10\frac{1}{2}$  feet, had 13 patients. This ward is used for cases of syphilis.

Third floor, general reception ward, 78 by  $42\frac{1}{2}$  by  $9\frac{1}{2}$  feet, 85 beds and 36 bedticks usually used, sometimes 14 additional bedticks added at night. Usual complement 121 men at night. Third floor, ward No. 9, old men's ward, rather better class of old men; ward is 56 by 34 by 9 feet; has 52 beds and 19 bedticks, all occupied at night.

Cottage, third story, ward 32 by 40 by 12 feet; has 13 beds; better grade of paupers. Second story, boys' ward; 8 beds (three of them double), 30 by 40 by 11 feet; 8 boys and 3 men occupants. Second story, east end ward. Ward, 12 by 32 by 11 feet, 1 ventilator in place of chimney, 12 by 14 in. grating; 4 idiotic youths (congenital) from 6 to 24 years of age, were the occupants.

In the middle of the court was a building used as a bakery and kitchen.

The committee were pleased to find a general air of cleanliness and neatness about the rooms and beds and about everything pertaining to the alms-house and asylum.

The diet was good so far as we had opportunity to examine it. Several cows are kept on the farm. The milk was good, but in what quantity it is furnished the hospitals and children I am not informed. The common vegetables are in part raised upon the farm and the balance required is obtained of neighboring farmers.

The limited space into which so large a number of inmates are crowded in all of the large wards would prevent the successful introduction of any system by which a proper and sufficient ventilation could be afforded. Either more room must be furnished or the number of inmates must be reduced to better the condition of affairs. As a general thing, no attempt at ventilation has been attempted. In one ward the number of cubic feet of air allowed per inmate has reached the almost unparalleled minimum of 240, not per hour but per night. From 1,000 to 3,000 cubic feet per hour has been the estimate in the construction of army barracks and hospitals, with an efficient method for ventilation in keeping with these requirements. Consider the women's ward, second floor, 38 by 60 by 10 feet,— $21,600$  cubic feet  $\div 40 = 540$  cubic feet per inmate. Two doors open into it and 12 windows, all shut. The air can not be changed in cold weather during the night to any perceptible extent. The stove heats the room, and no ventilators are in use. In mild weather the summer ventilation by doors and windows changes this condition, but during seven months of the year, and when the ward is most crowded, the doors and windows are shut.

On the general-reception ward for men, third story, this condition is much worse,—78 by  $42\frac{1}{2}$  by  $9\frac{1}{2}$  feet= $31,492$  cubic feet;  $31,492 \div 121 = 260$  cubic feet per man. When 135 men occupy the ward, as is sometimes the case in severe weather in winter, the number of cubic feet per capita is reduced to 232. There is no opportunity for any perceptible change during the whole night. I doubt whether this condition of affairs is paralleled outside of floor lodgings of a few tenement houses in New York, Liverpool, and Glasgow; for the reason that where there is a large pauper class, as in Great Britain, the system of unions, work-houses, and the frequent government inspections of them prevent this phenomenal crowding.

In view of the crowded condition of the wards, the superintendents of the poor intend building a new reception ward, where those coming to the alms-house may be received and inspected, and from which those having disease of any kind may be sent into the proper hospital ward, etc. This will be of great advantage in a sanitary point of view. The superintendents intend also to improve the ventilation of the wards by a system similar to that in the House of Correction in Detroit.

It will be noticed that there were 361 men and only 113 women in the alms-house at the time of inspection (March 22, 1884), more than three men to one woman. This may be accounted for in several ways. Men travel about the country in search of work, or in search of more agreeable work, or of more lucrative employment. In the nature of things they are more apt to cut themselves loose from their old associations and locations. There are more intemperate men than intemperate women, a prolific cause of want of employment. The disparity between the sexes in Wayne county is not very marked and does not bear largely on the case in point. On the other hand, women are weaker and more helpless than men, and are tied down largely by children left in their care, and indeed quite a large number of the women in the alms-house were there solely on account of their little children weighing them down and rendering them unable to be self-supporting, and there should have been found a much larger number of women in the alms-house than of men. The cause of the inverse condition of affairs from the legitimate one lies in the province of public morality rather than in sanitary science, and must be relegated to the department of charities and corrections.

It was estimated that about one-half the men were quite able to support themselves by manual labor, and should have been at work instead of being supported by charity and demoralized by idle living. It may not be strictly in the province of a sanitary inspection to suggest that the number of inmates should and could be largely reduced at the poor-house, and that fully one-half the men should be sent off or be made to work. There is latent power there, if properly directed, to more than half pay the expenses of the whole institution.

The impression of the committee was that the institution was fully as large as the county needs, if not too large for its actual necessities, if managed on the economical basis of working those able to work; and that there was a tendency on the part of the authorities to develop and extend the institution, rather than to limit it. The fact that idleness is encouraged by keeping half a regiment of able-bodied men in food, clothing, and shelter is patent; and so far the institution is demoralizing in its tendencies. The introduction of different forms of manual labor, and the commitment of paupers for definite terms of service, by the proper magistrates, with a certain per cent of earnings saved for the pauper, would be a great benefit to those able to work. This should include the commitment of all tramps and vagabonds who seek the shelter of the county-house on Saturday evenings, some 25 or 30, and raid it through the country and city during the week, greatly to the detriment of the community, in the frequency of criminal assaults of various kinds and in thieving and in malicious trespass. The views of the asylum and alms-house authorities were in accord with the committee in this matter.

The asylum for the insane was visited and inspected. It contained, as already mentioned, 210 inmates, and 9 attendants, besides the physician and matron. The building is about 200 feet west of the poorhouse. It faces the south and is rectangular in shape, and consists of two stories and basement, with

two new additions on north side. The surroundings are excellent; and the situation all that could be desired. The water-supply and drainage and sewerage have already been referred to as excellent.

The Mott water-closet is in use and the water-closets and urinals are necessarily in close proximity to the general wards and must be quite secure and simple in structure to meet the requirements of an asylum for the insane. They were in good condition and fairly ventilated. Some improvement is being made in this direction.

The halls have abundant light and are high and airy. The light comes chiefly from the south or front of the building. The physician's quarters are midway of the building.

The eastern half of the asylum is for women, and the western half is for men. The first ward east, 27 by 60 by 12 feet, is chiefly used for epileptic women; it contains 22 single beds; there are two ventilators, 12 by 14 inches, in flues in chimney. The second ward, 18 by 66 by 12 feet, is for older women of better class of people. This is heated by one stove, with hooded ventilators around the pipe, not at all adequate to ventilate the room, although of some service.

Second floor, third ward, 66 by 18 by 16 feet; off this hall are 12 rooms, 8 by 10 by 16 feet, with two single beds in each. Second floor, fourth ward, 27 by 60 by 11½ feet, with 18 single beds; jacket ventilator on pipe.

New addition, two stories; 12 rooms 8 by 11 by 12 feet; hall 34 by 54 by 12 feet; two beds in each; one Mott water-closet; one bath tub.

The west wing, men's ward, corresponds to the east wing in size, shape, and general arrangement, including the new addition.

There were five cells in the basement which will be disused in a short time, probably by May 1, 1884, so soon as the new additions have been finished. Certain cases of violent insane have been kept in the basement at times since the opening of the asylum, and the committee are glad to know that they are to be dispensed with so soon.

The committee were sorry to notice that the laudable efforts of the superintendents of the poor to ventilate the new additions was likely to prove a failure from the adoption of a very defective plan. The ventilating flues are all in the outside wall, with registers near the ceilings. These flues conduct into an open garret and a latticed cupola in the center of the garret opens a way out in case the air is warm in the garret. The objections to this plan are too numerous and too obvious to require entering into in this report, and particularly as the building has been already constructed.

The necessity for a more varied diet and a substitution of certain articles rather than an addition is essential in all hospitals; and the insane must be considered as invalids; and many are cured by a nutritious and assimilable diet, particularly among the poor.

Some industrial employment for the insane is desirable in view of its effect upon the mental condition. To feel that they are of some little service and that they can do some little work and are occupied will have its effect upon a certain per cent of the insane and may be employed as an aid to their restoration.

Increasing the number of attendants so that the insane might be more out of doors in the open air would be a great desideratum. It seemed possible that these might be furnished from the alms-house without much difficulty.

Some more effective system of ventilation should be effected here as well as



in the almshouse. Of course any plan of ventilation involves some expense. Warm or heated air must be the motive power, and the warm and used air must be supplied by fresh air, and this must be warmed; and this cannot be accomplished without some expense in heating it. In consequence of the better ventilation the tone and strength of the inmates would improve and a larger number would be able to go out from both institutions.

The following correspondence between the chairman of the committee of inspection and the physician of the asylum, is given:—

MICHIGAN STATE BOARD OF HEALTH,  
Detroit, March 29, 1884. }

Dr. E. O. Bennett, Medical Supt. Wayne Co. Insane Asylum:

DEAR DOCTOR,—I expect to make a report to the State Board of Health on the 8th proximo. Will you kindly send me by early mail a report showing from diagrams of your hospital-building the windows and doors of the several wards, with size of each as near as may be, and also the size of the ventilator in the roof of new addition.

(1) I would like also a record of the sickness and mortality for the past 2 or 3 years, with average number in hospital.

(2) Have you opportunity to give the insane fresh air and exercise out of doors?

(3) Have you a proper and sufficient number of attendants to permit you to afford such liberty as is most conducive to a cure?

(4) Is the ration afforded such as a majority of insane require for their proper treatment, according to the experience of other hospitals for the insane?

(5) Have you any fund or method by which the ordinary ration suitable for working men in out of door employment can be exchanged for a lighter and more assimilable food?

Please make such suggestions as you deem expedient in order to complete my report.

Please send a copy of diet list for the week in which this inspection was made.

Please return this letter with your report in order that it may be embodied in my report.

Very respectfully yours,

HENRY F. LYSTER, M. D.,

Chairman of Committee on Sanitary Inspection.

WAYNE COUNTY INSANE ASYLUM,  
Wayne, Mich., April 2, 1884. }

Henry F. Lyster, M. D.:

DEAR DOCTOR,—I herewith enclose your letter with brief replies to your questions in the order in which they are numbered.

(1) I have been connected with this asylum for three years and during that period no contagious diseases have prevailed in the institution; there have been but few acute cases of any kind and those of a tractable character. The number of deaths for 1882 and 1883 was thirteen and seventeen respectively, and all were the result of some form of insanity or the debility of age.

(2) Patients are necessarily confined to the house during winter months for want of extra clothing and attendants to take charge of them, but in summer they have access to yards in the rear of the building. These yards are about 5 by 10 rods for each sex, enclosed by board fences from ten to twelve feet high.

(3) The number of attendants is inadequate to properly care for the inmates. I have only nine attendants for two hundred and fourteen patients.

(4) The ration provided is sufficient in quantity, the quality is fair, but the variety is wanting. Good bread, meat, tea, coffee, and some vegetables are the principal articles of diet. Butter, milk, eggs, etc., are not supplied in sufficient quantities for the requirements of such an institution.

(5) The sick receive the same diet as the keeper and attendants; the remainder get uniform fare, and such articles as provided by the superintendents of the poor. The number of attendants is limited, and the purchasing of provisions not under any control. I cannot send you a copy of the diet list for the week you were here—it is varied from week to week to accord with supplies on hand.

(6) The water-supply was largely increased last fall and is equal for all demands. A well 12 feet in diameter and bored to the depth of 165 feet, and a spring of soft water one-half mile distant, the water passing through iron pipes, are the sources of supply.

In way of recommendation I would suggest:—

(1) That the medical staff be increased.

(2) That there be an attendant to every fifteen patients.

(3) That the diet of the insane be under the direction of the medical superintendent.

(4) Better ventilation provided for the old wards.

Very sincerely yours,

E. O. BENNETT,

Medical Supt. Wayne Co. Insane Asylum.



Dr. Bennett also kindly sent drawings [not printed] of the ground-plan of the buildings, which herewith accompany this report.

All of which is respectfully submitted.

HENRY F. LYSTER, M. D., }  
C. V. TYLER, M. D., } *Committee.*

## REPORT OF THE CONDITION OF THE JACKSON COUNTY JAIL.

BY VICTOR C. VAUGHAN, M. D., AND J. H. KELLOGG, M. D., COMMITTEE OF THE STATE BOARD OF HEALTH.

Your committee, appointed to inspect the Jackson county jail, did so, April 18. In company with Dr. N. H. Williams, we visited the building, which contains rooms for the jailor and his family, as well as the jail proper. The house is a brick structure, two stories high, and by no means dilapidated in appearance. The apartments for the prisoners in the lower story consist of a corridor about 12 feet by 20 feet, with the cells back of and opening upon this corridor. The corridor was filthy in the extreme, with no ventilation, and was heated by means of a large coal-stove. We could find no provision whatever for admitting fresh air into this room. In the ceiling there are two openings from which stove-pipes pass up through the roof. These pipes doubtlessly carry off a small amount of foul air in the winter.

There are fifteen cells, each about  $5\frac{1}{2}$  by 7 feet. The bedticks were scantily furnished with straw, and all the bedding was extremely filthy. The prisoners stated that the bedding was filled with vermin. From the filth and stench, this statement could be readily believed. In this corridor were 19 prisoners.

It was very evident that those in charge were largely blamable for the great accumulation of filth. While the apartment is altogether too small, and is imperfectly arranged, those in charge might have caused the worst of the filth to be removed.

This corridor could be put in fair shape at a very small expense, by placing another coal-stove in the room and placing around the stoves sheet-iron jackets connecting with pipes from the outside, through which fresh air may come, and by bringing large foul-air pipes down nearly to the floor and heating them in the second story.

The cells should be enlarged and cleared of the filthy accumulations.

Lastly, if the number of prisoners in the jail at the time of our visit is an average, the jail capacity should be doubled.

In the rooms up stairs, there was the same evidence of shameful uncleanness. There were piles of dirt in the corners and an old sink was filled with bad-smelling refuse.

V. C. VAUGHAN, }  
J. H. KELLOGG, } *Committee.*

## INSTITUTION FOR THE DEAF AND DUMB AT FLINT.

In February, 1884, the following communication was received from the secretary of the State Board of Corrections and Charities:

MICHIGAN BOARD OF CORRECTIONS AND CHARITIES, }  
*Secretary's Office, Lansing, February 16, 1884.*

*Henry B. Baker, M. D., Secretary of State Board of Health:*

DEAR SIR,—The State Board of Corrections and Charities at its late meeting in Detroit, Febru-

ary 12, 1884, instructed me in behalf of the Board to request you as Secretary of the State Board of Health, to examine the institution for the Deaf and Dumb, at Flint, with reference to its sanitary condition, and to report to this Board, with a view of laying such report before the Board of Trustees of said institution.

By order of the Board.

W. J. BAXTER, *Secretary*.

As the secretary of this Board had but a few months before examined the Institution for the Deaf and Dumb, and made a report at a joint meeting of the Board of Trustees, and of the Board of Charities, the Governor being present as a member of the Board of Charities, it did not seem imperatively necessary to make another examination at once, and on account of other duties the examination has not yet been made.

### REFORM SCHOOL, AT LANSING.

In compliance with a request by Hon. Josiah W. Begole, Governor of Michigan, the State Board of Health appointed a committee to examine the sanitary condition of the State Reform School, at Lansing, especially as regards drainage, sewerage, and the disposal of slops and excreta. The committee consisted of Drs. Baker, Kellogg, and Vaughan, members of the Board. The examination was made July 8, 1884, by Drs. Baker and Kellogg for the committee, assisted by Dr. Avery, president of the State Board of Health. Their report is as follows:—

#### *To the Members of the State Board of Health:*

July 8, 1884, Drs. Baker and Kellogg, of the committee, accompanied by Dr. Avery, president of the Board, examined the cottage that this Board approved plans for some years ago, and found that the plans as approved had been fairly well carried out in the construction of the building; and that the ventilation and sanitary arrangements generally seemed to be satisfactory, excepting the rooms occupied by the persons who have charge of the building, in which rooms the plans for ventilation had not been adhered to, and the ventilation was very imperfectly provided for. The north wing of the main building was in process of construction, and it was not practicable to see yet whether in it the plans for ventilation were being fully carried out or not.

The committee next examined the disposal of sewage and the work which has been done toward the east of the Reform School in efforts to reclaim the foul marsh and pond holes into which the sewage has for years been emptied. The condition of the pond-hole nearest to the Reform School was bad, but there was evidence of extremely great improvement extending back many years. Acres of it had been filled by earth removed from neighboring hills, and had been reclaimed from marsh where reeds and flags grew to comparatively firm land. The area of the filthy hole had been greatly restricted. The same is true of the second nearest swamp-hole. A drain had been laid in such a manner as to lower the level in the second swamp-hole several feet, by emptying it into a third. We visited the third swamp-hole, about one-fourth of a mile from the institution, where work was then in progress. An immense ditch was being dug, which it was expected would still further lower the level of the water in the pond-holes. This great amount of work had been done, and when they complete that filling-in process and the lowering of the distant drains, the disposal of sewage will not then be entirely satisfactory. The chairman of this committee suggested the attempt to dispose of the sewage by the downward intermittent filtration system, letting the outflow come alter-

nately on different tracts of thoroughly underdrained land. He suggested that this should be tried there even though the sewage had all to be pumped to a higher level in order to reach the proper underdrained land where the sewage was to be disposed of. The superintendent of the Reform School seemed to think the best solution would be to construct a sewer from the institution to the Grand River near North Lansing.

Whatever disposal is made of the sewage would seem to require some considerable outlay of money at the outset; and the subject is of such importance that the appropriation of money for this purpose would seem to be proper and necessary to the continued healthfulness of the inmates of the institution.

JOHN AVERY, *President*.      HENRY B. BAKER, }  
JOHN H. KELLOGG, } *of Committee.*

### INDUSTRIAL HOME FOR GIRLS, AT ADRIAN.

August 19, 1884, a letter was received from the secretary of the State Board of Corrections and Charities transmitting a resolution by that Board requesting an examination of the Industrial Home for Girls, at Adrian. The resolution is as follows:—

“Resolved, That the State Board of Health be requested to examine the Industrial School for Girls, at Adrian, and to report to this Board on the following points, among others:—

“As to the water-supply, and its sufficiency for sanitary and other purposes.

“As to ventilation of the different buildings, chapel, school-rooms, the new cottage, its water-closets, outside privy; and whether the construction has been approved by said Board.

“Whether the outside privies, the location, and method of flushing are proper, and have been approved by said Board.

“And to make recommendations and suggestions as to the above and other matters examined by them.”

In compliance with this request, Drs. Kellogg, Vaughan, and Lyster, of the State Board of Health were appointed a committee to make the investigation. Their report is as follows:—

#### REPORT OF A VISIT TO THE INDUSTRIAL HOME FOR GIRLS, AT ADRIAN.

BY PROF. VICTOR C. VAUGHAN, MEMBER OF THE STATE BOARD OF HEALTH, ANN ARBOR, MICH.

*To the Michigan State Board of Health:*—In accordance with the request of Dr. Kellogg, chairman of the committee appointed by the president of this Board to visit the Industrial Home for Girls, at Adrian, I went to Adrian, Sept. 13, but was sorely disappointed in finding that neither Dr. Kellogg nor Dr. Lyster had been able to keep the appointment. However, I thought it best for me to inspect the buildings as far as my time would permit and report my observations to this Board. In the first place I desire to state that according to my understanding of the object of this inspection, it is for your committee to speak of the sanitary conditions of the school only. In company with Dr. Logue, of Adrian, and Dr. Wilder, physicians to the school, I visited the new cottage, Clark cottage, Groswell cottage, and the chapel. My time did not permit me to visit the other cottages, Honor and Gillespie.

**NEW COTTAGE.**—In this cottage, which has just been finished and is only partially occupied at present, the only thing needing criticism, in a sanitary sense, is the construction of the so-called strong rooms in the basement and in the attic. These rooms are used for the confinement and punishment of



refractory inmates. I was informed that the strong rooms in this cottage have never been used yet; but the purpose is to use them as is done in the other cottages. In these, girls are kept under lock for 24 hours and longer. The strong rooms in the basement are about 8 by 10 ft. in the clear, with solid brick walls and with no provision for ventilation, light, or heat. Being in the cellar through which steam pipes pass, the temperature of these rooms will probably be high enough, however. But no animal should be confined in one of these rooms for 24 hours, be that animal beast or human. The probability is that the rooms will never be used. The strong rooms in the attic have no provision for heat or ventilation, and the fact that they will be too hot in summer and too cold in winter should also prevent their ever being used as prisons.

It will be remembered that this Board in examining the plans for this cottage expressed earnestly its disapproval of these strong rooms on account of the entire absence of ventilation in them.

This is a handsome, well-arranged cottage, and barring the statements already made, I found nothing deserving criticism.

**CLARK COTTAGE.**—In this cottage the new arrivals are first placed. One strong room examined in the basement, and which is frequently used, is to some extent furnished with both light and air. The whole building, however, needs revision in order to establish ventilation. There is no means of removing the foul air from the large rooms save by the windows. For instance, the sewing room, in which there are often more than 30 girls for several hours, is heated by a large steam coil, but there is no provision for the removal of the foul air. Of course, at the time of my visit, the windows were open and the air good; but this could not be the case in the winter. Everything about this cottage seemed to be kept most scrupulously clean and in perfect order.

**CROSWELL COTTAGE.**—In this cottage are placed the most refractory girls. The same criticism as to lack of ventilation is to be made here as in Clark Cottage. The strong rooms could not be examined, as the keys could not be found by the lady in charge.

**THE CHAPEL.**—During the afternoon the girls are at school in the chapel. There is provision for the admission of fresh air, but none for the exit of foul air. This deserves especial attention on account of the large number of pupils in the building.

There are now in the whole school, so Dr. Wilder informs me, about 160 girls. The capacity of each cottage is about 40, and there are five of these cottages.

While, as shown above, the sanitary conditions of the buildings are not perfect, and the ventilation might have been made adequate as well as not when the cottages were erected, still we must say that the children sent to the reform school at Adrian have a home with better sanitary conditions than are possessed probably by a majority of the homes of Michigan. The water-closets and bath-rooms are clean and free from any disagreeable odor. We were informed that the only difficulty with the sewerage arises from lack of sufficient water sometimes for flushing-purposes.

V. C. VAUGHAN.



## BOILER-IRON CELLS IN JAILS, AND SANITARY CONDITION OF THE STATE HOUSE OF CORRECTION AT IONIA.

August 28, a request was received from the State board of charities for an examination as to the sanitary character of boiler-iron cells in jails, as usually constructed; and for an examination of the sanitary condition of the State House of Correction and Reformatory, at Ionia. This request was submitted to the State Board of Health at its regular quarterly meeting October 7, 1884, when Drs. Lyster and Kellogg were appointed a committee to examine into the sanitary character of boiler-iron cells, and Drs. Avery and Tyler were appointed a committee to examine into the sanitary condition of the House of Correction at Ionia.

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## EXAMINATIONS OF PLANS FOR PUBLIC BUILDINGS—YEAR ENDING SEPTEMBER 30, 1884.

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REPORT BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

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Section 7 of act 206 of 1881 requires boards of State charitable, penal, or reformatory institutions before adopting plans of buildings for school purposes, living-rooms, work-rooms, or sleeping-rooms for inmates, or for any system of sewerage, ventilation, or heating, authorized by the Legislature to be constructed, to submit such plans to the State Board of Corrections and Charities and to the State Board of Health for examination and opinion thereon. On pages 339-343 of the Report of this Board for 1882 is a copy of the law and a report of examinations by this Board during the fiscal year 1882; and on pages 29 and 117-120 of the Report for 1883 is a report of examinations during the fiscal year 1883.

October 29, 1883, at a special meeting called for that purpose, plans for the new north wing of the main building of the State Reform School at Lansing were examined. The following is the report of the examination, made to the board of control:—

MICHIGAN STATE BOARD OF HEALTH, }  
*Office of the Secretary, Lansing, Michigan, Oct. 31, 1883. }*

*To the Board of Control of the Michigan State Reform School:*

GENTLEMEN,—At the special meeting of the State Board of Health, Oct. 29, plans for the north wing of the new main building at the State Reform School were presented and explained by your architect, Mr. L. D. Grosvenor. The plans show that careful study has been given to sanitary affairs. They show a building with a basement for steam-pipes, ventilating-pipes, etc.; a dining-room on the first floor, the full area of the building; the second story for bedrooms, closets, etc., including a bathroom for use of employees; and an

attic not used except for timbers to support the building over the dining-room; two inlets for fresh air to the heating-chamber, near the northeast corner of the basement, one inlet on the north and one on the east side of the wing; the air thus admitted to supply the dining room; the air to be supplied to second story to be admitted on east and west sides of the wing, and be warmed by steam coils, not more than two rooms to be supplied from one coil-chamber. No further details of the heating of the air supplied to either story were submitted. The foul-air outlets in dining-room to be under each window, through registers in wall at floor level, about six by eighteen inches in area, the aggregate area being about twenty-five square feet. The foul-air exits lead to the space beneath the floor, which is to be furred up three inches above the joists, this space to be open throughout to the ventilating space in the basement, from which rises the ventilating-shaft, in the northeast corner of the building, which is to carry all the foul air from the building. To ensure a draft in this shaft, it is to be supplied with a steam-coil placed just above the opening into the shaft from the second story. The foul air is to be removed from the second floor in substantially the same manner as from the dining-room, using the space between the ceiling of the dining-room and the floor above as an air-chamber into which the foul air from second floor is to go on its way to the shaft in the northeast corner of the building. The ventilation of the bath-room to be by a separate shaft which shall have provision for its being heated. The soil-pipe from the bathroom to be of cast-iron, four inches, open full size to above the roof, and unobstructed by traps on the house side of the fresh-air inlet near its foot, being double-trapped on the sewer-side of the air-inlet.

The State Board of Health having carefully examined the plans, I am instructed to report as follows:—

1. This Board respectfully recommends that the basement have a concrete floor, and that the floor and the partition walls in the basement be covered with a well-troweled coat of Portland cement mortar.

2. This Board does not approve of having the doors of exit from dining-room swing inwards, as shown on the plan. They should swing outward as the law requires for public buildings.

3. Because of the near proximity of the Cottage on the north, and for other reasons, this Board recommends that the inlets for fresh air for the dining-room be on the west and on the east, instead of on the north and east as shown on the plans. The fresh-air inlets should be high enough above the earth to ensure that the air taken in shall be free from surface dust and ground air.

4. The Board does not approve of using the entire underfloor space as a foul-air chamber. (One reason mentioned was that the ceiling of basement under the dining room, which is to be of lath and plaster, is liable to be broken, and somewhat porous when not broken; consequently there was no certainty of the foul-air being withdrawn from the dining-room; and the ceiling of the dining-room which is to be of wood, is liable to shrink and crack so as to permit the foul-air from the upper floor to mingle with the air of the dining-room.)

5. It was the opinion of the Board that there should be outlets for foul-air into more than one foul-air shaft,—at least one at each end of the building, the combined capacity of which shafts shall be sufficient for the removal of at least two thousand cubic feet of air per hour for each occupant. That there should be capacious air-tight ducts of tin or galvanized-iron, and free

from obstructions, connecting the openings under each window with the foul-air shafts. These metallic foul-air ducts to each shaft should be entirely independent of the ducts leading to another shaft.

6. The ducts for the ventilation of the second story rooms should lead into shafts or compartments of shafts entirely separate and distinct from any compartment used for the ventilation of the dining-room below. (One reason mentioned was the liability of one story to receive the foul-air from the other, when one shaft is used for rooms on two stories.)

7. This Board approved of the plan of having the bathroom ventilated by a separate foul-air shaft, provided with heat,—also of the plan to have all foul-air shafts heated so as to ensure permanent and sufficient draft.

Very respectfully,

HENRY B. BAKER, *Secretary.*

February 12, 1884, at a special meeting held for that purpose in Detroit, plans for the Asylum for Insane Criminals, at Ionia, were examined. The following is the report of the examination, made to the State Board of Corrections and Charities:—

MICHIGAN STATE BOARD OF HEALTH,  
*Office of the Secretary, Lansing, Mich., Feb. 13, 1884.* }

*To the Michigan State Board of Corrections and Charities:*

GENTLEMEN,—At a special meeting of the Michigan State Board of Health, held at the Russell House in Detroit, February 12, 1884, the plans of the proposed Asylum for Insane Criminals at Ionia, were presented by your Board, and explained by the Architect, Mr. Gordon W. Lloyd. (Some of the members of this Board had previously examined the site, and the work on the foundations, at Ionia.) The undersigned were directed by the State Board of Health to communicate to you the result of the examinations; which may be stated as follows:—

1. The site is not entirely satisfactory; the area of available high ground being too small, and being in the immediate vicinity of much low ground which is overflowed during some seasons of the year. (We have been informed that there was no appropriation for the purchase of other ground.)

2. The general plan of the building seems to be well adapted for the safety of the health of the inmates. The heating and ventilation of the building might be more satisfactory if the steam-heating were prepared for it especially, separate from the present prison, and a fan was provided for forcing in fresh air at such times as the temperature of the air in the building does not differ much from the air out-doors.

3. A few suggestions were made by members of this Board, for the slight modification of the plans: with respect to additional fresh-air flues in the dining-room; the entire separation throughout their extent of the air-ducts for the removal of the foul air from the different sides and ends of the building; provision for additional privy-accommodation; for placing the catch-basins at greater distances from the building, and providing them with separate ventilation, etc., nearly all of which suggestions, it is understood, are accepted by the architect, and noted on the plans or specifications. (A memorandum of these suggestions is sent to the secretary of your Board.)

4. Considering the terms of the law, the amount of the appropriation, and the alleged number of insane criminals to be provided for, the plans seem to



make the best provisions for the health of the inmates, practicable, and they are, therefore, approved by this Board.

JOHN AVERY, *President*.

HENRY B. BAKER, *Secretary*.

The following is the memorandum of suggestions referred to in the preceding report:—

1. Additional fresh-air flues into the dining-room.
2. Carry the divisional diaphragms in the foul-air flues or ducts to the points where the air passes out above the roof; thus making an entire separation, throughout their extent, of the ducts for the removal of the foul air from the different sides and ends of the building; this being for the purpose of guarding against the danger of the pressure from the windward side preventing the outflow of foul-air from the opposite side or opposite end, of the building.
3. Specify the size of the soil-pipes.
4. Provide for additional privy-accommodations—about twice as many seats as shown on plans.
5. Place the catch-basins at greater distances from the building, and provide for their ventilation other than up through the soil-pipe, which will not properly ventilate a catch-basin in warm weather when there are no hot steam pipes in the pipe-shaft.
6. Let the fresh-air opening into the foot of the soil-pipe be separate from the catch-basin. A trap might be placed just where house-drain enters catch-basin.
7. Let the waste-pipes from the kitchen-sinks enter a catch-basin separate from any one which receives flow from a soil-pipe.

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## REPORT ON AN OUTBREAK OF TYPHOID FEVER AMONG SCHOOL CHILDREN AT ADRIAN, MICHIGAN.

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BY DR. HENRY F. LYSTER, COMMITTEE ON EPIDEMIC, ENDEMIC, AND  
CONTAGIOUS DISEASES.

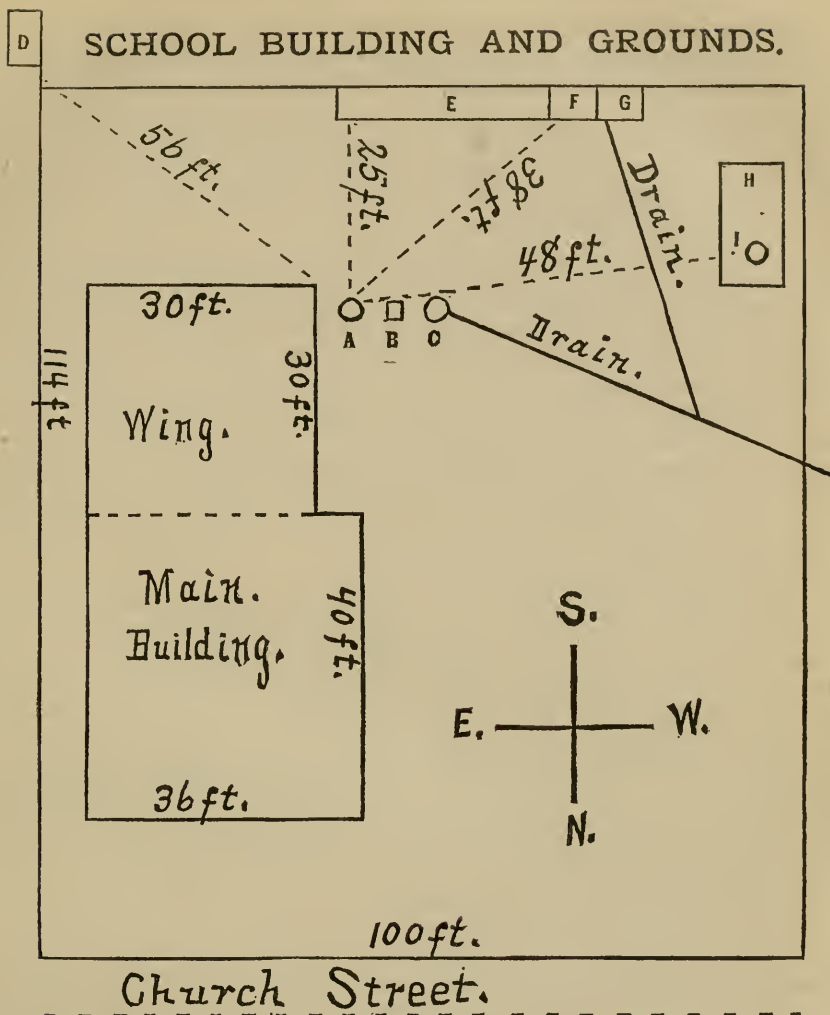
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*To the Michigan State Board of Health:*

GENTLEMEN,—In accordance with the suggestions of Dr. Henry B. Baker, the secretary, I visited the city of Adrian, October 24, 1883, to make a sanitary inspection of the epidemic of typhoid reported at that place. I telegraphed Oct. 21 to Dr. J. Tripp, the health officer, to notify him of the intended visit of the committee. In company with Dr. Tripp and several other members of the city board of health the committee visited the premises of the school.

The building was of frame, and had been built for sixty years. It was forty by thirty-six feet, and two stories high; an extension toward the rear was thirty by thirty feet, and two stories in height. This building had been used as a tavern, or inn, for most of the period mentioned. A diagram of the building and grounds is printed on page 37.





A, Well, 3 ft. from wing of school-building; 56 ft. from overflowing privy-vault, D, on adjoining lot east; 25 ft. from old privy-vaults, E, south; 38 ft. from privy-vaults, F, and G, southwest, in use; 48 ft. from stable, H, west, under which was an old overflowing privy-vault, I, and about which were a manure pile and barnyard.

B, Catch-basin, 3 ft. from well.

C, Stench-trap, 3 ft. from catch-basin.

D, Overflowing privy-vault, 56 ft. from well.

E, Old privy-vaults, 25 ft. from well.

F, G, Privy-vaults in use, 38 ft. from well.

H, Stable, 48 ft. from well.

I, Old vault, overflowing, under stable.

Main building of school-house 40 by 36 ft.; wing 30 by 30 ft.; grounds 100 by 114 ft.

See descriptive statements on pages 35, 38; and in letters by Dr. Tripp, on pages 41-42.

There was a cellar under the main building divided into two parts. The front cellar was a simple excavation, but the rear one was floored with boards with the exception of a small space. The cellars were dry and well ventilated, and were disinfected by chloride of lime. The rear cellar was walled up and in fair condition for the character of the building, and was partially floored. There was a damp place in one end. The air was somewhat musty. There was a natural ventilation through the door. There was nothing objectionable in the construction of the building.

The grounds on which the school-house stood were a gravelly loam, quite porous, and not liable to retain water upon its surface, and the surface indications were that it was many feet down to water. The enclosure was 100 by 114 feet.

The well was found immediately by the kitchen door on the north, and not more than three feet from the wall of the building. It was covered by plank, and was walled up with brick dry-laid. It was about 35 feet in depth; a suction-pump was used to draw up the water. It had about four feet of water in it at the time of the examination. It had not been in use for three weeks. A hopper-shaped catch-basin of oak was near the well, so arranged as to catch the drip from the pump. This extended down into the soil for three feet, and was connected with a crock-drain of vitrified pipe with joints laid in water-lime cement. Upon drawing the water it appeared clear and transparent and was not unpleasant to the taste.

Ranged side by side along the rear of the lot and not more than thirty feet distant, were a number of disused privy-vaults, which, when full of fecal matter, had been covered over with soil and permitted to remain as silent mementoes of a once busy hostelry, the wooden superstructure having been moved to the latest though not least offensive vault now in active commission. A large vault filled up and disused on this account, was found just to the southeast of the well, beyond the house, and in the rear of a neighbor's premises and not more than fifty-six feet distant. A foul stable-yard and manure pile was in the southwest corner. The surface of ground occupied by this range of vaults was slightly higher than the surface of the well, although there was no overflow into it, on account of the even distribution of the rainfall throughout the year in that region.

Upon the removal of the well-curb, and looking down into the well, organic matter could be seen floating upon the surface of the water. Upon an examination of the drain, at my urgent request, the board of health found a leak six feet from the well, and traced the escaped contents to a little depository, or self-made cesspool, within three feet of the well-wall. The inference that this cesspool leached into the well is without doubt correct, and conforms to the law regulating the flow of water.

Samples of the well water were obtained and put up in clean glass jars and sealed and sent to two competent analytical chemists. One gallon to Prof. V. C. Vaughan, of the University of Michigan, at Ann Arbor; and one gallon to Prof. John E. Clark, of the Michigan College of Medicine, at Detroit. The respective analyses are herewith submitted, showing the well water charged with impurities in such quantities, and of such character as to render it wholly unfit for use.

*Analysis by Prof. Victor C. Vaughan, of Ann Arbor.*

*Dr. H. F. Lyster, Committee on Epidemic, Endemic, and Contagious Diseases :*

DEAR SIR,—I find that the water sent to me by you from Adrian contains much organic matter, as shown by the following figures:—

Chlorides.....	8 grains per gallon.
Free ammonia.....	0.10 of a part per million.
Albuminoid ammonia....	0.05 of a part per million.

The large amounts of chlorides and free ammonia indicate contamination from sewerage or privy-vaults. It is considered that when the free ammonia reaches above 0.08 the water is contaminated with urine.

The large amount of free ammonia necessitated repeated distillations, as in the first distillate there was so much free ammonia that my Nessler's reagent gave a precipitate. The second distillate (50 c. c.) was diluted to 200 c. c. with distilled water, but still precipitated. In the third trial I diluted the 50 c. c. of distillate to 500 c. c. and was then able to finish the estimation. This accounts for the delay in making my report.

Yours,

*Ann Arbor, Mich., Nov. 3, 1883.*

V. C. VAUGHAN.

*Analysis by Prof. J. E. Clark, of Detroit.*

*Dr. H. F. Lyster, Member State Board of Health :*

DEAR SIR,—Enclosed please find the result of my analysis of the sample of water furnished me from the suspected Adrian well:—

	Parts per Million.	Grains per Gallon.
Total solids.....	625.	43.75
Chlorides.....	110.	7.75
Free ammonia.....	.825	.05775
Albuminoid ammonia....	.183	.0128

I am aware considerable discrepancy exists between this result and the one obtained at Ann Arbor (a fact which occasions the delay in forwarding you this statement) for, fearing an error in my calculation, I instituted a second series of analyses, with the result enclosed, and not materially differing from my first analysis. The conclusion I arrive at from my analysis is, that the water is little better than effluent sewage, and that, if the presence of organic material in drinking-water tends to explain the causation of an outbreak of typhoid fever, you have in this water ample opportunity for practical investigation.

Yours respectfully,

*Detroit, Mich., Nov. 15, 1883.*

J. E. CLARK.

The presence of chlorides and of ammonia was determined to be in such quantity that it must necessarily be classified as poisonous, and little better than ordinary sewage. There could be no doubt but that it received either the filtration from the neighboring vaults and stable-yard, or the direct supply of faecal matter and urine from the leaky drain at the well, or both.

The principal of the schools, Prof. Harbeck, reported that the faecal evacuations and the urine from his little son, the patient who had been the first case of illness, had been frequently thrown into the catch-basin near the well, in the morning when the bedrooms were made up for the day. While this method may not have been the usual or constant one for disposing of the slops from the chambers of the house, the inference would naturally be drawn that what was convenient one day would be convenient the next.

The children at the school had been given during the summer the back yard to play in, and came down a back stairs into it from the schoolroom. Two tin cups hung upon small iron chains at the pump, and the pump became the most prominent feature in the somewhat uninteresting playground. It is well known how thirsty a child suddenly becomes upon seeing another child drink-

ing, and the fact is well attested that the children amused themselves drinking water at the well each day.

The first case of fever occurred in a boy aged six years, Martin Harbeck, a son of the principal of the school, Sept. 7, 1883. He lived with his parents on the first floor of the school-building. He was visited by the family physician, Dr. J. K. Piersol, Sept. 11, who pronounced it typhoid fever. The child had not been away from home.

The dejections were ordered thrown into the vault. The boy had hemorrhages from the bowels, bladder, and nose in the fourth week; epistaxis, or bleeding from the nose, during the whole sickness. He had several passages in twenty-four hours, delirium, emaciation, petechia, and abscesses in the subcutaneous cellular tissue. I saw this patient Oct. 24; he was still confined to the bed, and was quite weak, although convalescent. He showed the cicatricial depressions of superficial abscesses at a number of points. He finally recovered.

Dr. Piersol was called Oct. 4th to see L. B., a young lady living next door. She was between twenty and thirty years of age; she had typhoid fever. The family in this house used the water from the school-yard well. This patient had been sick a week previous to the doctor's visit. She had a rather delicate constitution, with a chronic cough. She had nose-bleeding. She died in four days after the doctor's first visit, with chest symptoms, indicating catarrhal pneumonia as a complication of the enteric fever.

These two cases directed attention to the well, and at the doctor's request the water was not used. The doctor examined the water with a microscope, and found vibriones and much organic matter, both animal and vegetable. The well had been cleaned out in June, the water having been reported as bad in the spring, pieces of dead earth-worms having been brought up by the pump.

The third case under the care of Dr. Piersol was a daughter of John Smith. She was aged four and one-half years, and was a pupil in the school. The first visit was made Oct. 7. The case was mild with but little fever, but with a continuous diarrhœa. This case was still under treatment at the date of my visit, Oct. 24.

The fourth case under the same physician's care was Charles Prange, aged six years. The first call was made Oct. 19. The boy had been sick at that time four or five days. The committee visited the little patient Oct. 24, the middle of the second week of the fever. This was a well-marked case of typhoid fever; the pallor, the typhoid state, the mental hebetude, all indicated this. The patient slept a great deal, and could not be roused to speak intelligently. Temperature in axilla, 102; pulse, 108, at 3 p. m.; sordes were observed on teeth; abdomen pot-shaped and tympanitic; petechia; bowels constipated; when moved by enemias, ochre-colored stools observed.

A case under Dr. Jewett, one of the pupils, named Burger, aged six years, at end of second week, Oct. 17, had all the well-known symptoms of typhoid fever, was reported seriously ill; she was a pupil in the school.

The committee saw Annie Harbeck, aged two years and three months. Her temperature was 101° at 3 p. m.; abdomen bloated and tongue red. She was a sister of the first patient, and was living at the school-building. Her case was a mild one, and did not run a definite course. The mother had also some symptoms of fever, but they did not develop.

The committee saw a number of cases under the care of Drs. R. and A. M. Stephenson, which are fully reported in the following clinical record.



Reports of cases were also transmitted by Dr. W. R. Morden, Dr. Charles Rynd, Dr. Charles R. Lards, and Dr. J. Tripp, the health officer of Adrian.

The following communications relative to this outbreak, received from the secretary of the State Board of Health in regard to the proposed visit to Adrian, and from parties in Adrian, in reply to requests for information, are submitted as a part of this report:—

MICHIGAN STATE BOARD OF HEALTH,  
Office of the Secretary, Lansing, Michigan, Oct. 22, 1883. }

Henry F. Lyster, M. D., Member State Board of Health, Detroit, Mich.:

DEAR DOCTOR,—Your letter of Oct. 20 has been received. I think it would be well to visit Adrian and investigate the matter. Robert Stephenson, M. D., is our Adrian correspondent, but I have not heard from him on this subject. The person who first reported the outbreak is I. C. Wiesinger, who is, I think, a druggist. I quoted all of his letter that is pertinent, in my last letter to you. Since writing you, I have received a report of the outbreak from the health officer of Adrian, Dr. Joseph Tripp, who reports twenty cases of typhoid fever, all of which have occurred in a German school, which has been suspended. He says the disease is supposed to have been caused by drinking water contaminated from an old privy-vault about twenty feet distant from the well. The first case occurred about the last of September.

Very respectfully,

HENRY B. BAKER, Secretary.

Dr. Baker, Lansing, Mich.:

Excuse me for approaching you, but am obliged to do so. There is a German school here with an attendance of about 80 scholars. Two weeks ago one scholar was taken sick with typhoid fever, and since then 17 more have been taken down the same way, it proving fatal to one young lady 23 years of age, living the next house to said school. On the premises are one old privy-vault covered up with plank and earth and one still in use which is about 25 feet from a well. The building up to five years ago was a hotel, kept a good many boarders, and in the rear end of same beer was largely sold. The parties outside from the school children have been using water from the well for cooking and drinking purposes, especially the family where above-mentioned one died. I should like very much to have this water tested to see if it is poisonous or not, as there is quite an excitement here about the matter. Two doctors have been looking over the ground and lay the disease to the water, but have not made any examination of the same. I have been working at it for a day but am not far enough advanced to go into the organic analyses; have analyzed it but find no traces of lead, iron, etc., and find nothing more than the common constituents of water. Answer at once and greatly oblige.

Adrian, Mich., Oct. 12, 1883.

I. C. WIESINGER.

FROM DR. JOSEPH TRIPP, HEALTH OFFICER OF ADRIAN.

H. F. Lyster, M. D.:

DEAR SIR,—I sent the water by express as directed, yesterday. I enclose a diagram of the building and surroundings. I visited the premises this morning. I found on the side east, on the lot joining, a privy-vault full and running over. I have marked it on the diagram. I also found under the stable dirty water, draining of the yard, etc. I have directed to have the sewer examined several feet from the well, etc.

I have made the test you spoke of. The water in my well yielded a bluish-white precipitate, not so heavy but what you could see through. The water from the bad well was of a very heavy, turbid, bluish color, very much different from the water out of my well. Very truly yours,

Adrian, Mich., Oct. 26, 1883.

J. TRIPP.

H. F. Lyster, M. D.:

DEAR DOCTOR,—Yours of the 23th is at hand. The distance from well to the vault is 40 [56] feet southeast, and 30 feet from the end of school-building. The teacher said he put a little chloride of lime in the wooden catch-basin, none in the well. We found a leak in the drain about six feet from the well, and the contents of drain had flowed back towards the well, say within three feet of the well. That is the only way the lime could get in the well. I have no means of knowing the quality of water in the wells of the vicinity as we have no water-commission and no water-works.

You remember the barn on the west of the school-building. I made another investigation yesterday. I found under the barn an old vault open, about eight or ten feet square. The late heavy rains had filled it to overflowing, and under the barn the ground was covered with filthy water several inches deep. Now, this vault is only 50 feet from the well, on the west.

The number of children sick is 20, number of adults 7, who have used the water. The ages of children run from 9 to 15 years. There have been no new cases, and only two deaths thus far.

I give you a list of the names of physicians : Drs. R. Stephenson & Son, M. R. Morden, J. K. Piersol, W. E. Jewett.

The board of health had a meeting Monday night, and ordered the old vault cleaned out and contents moved from the premises.

Very truly yours,

Adrian, Mich., Oct. 31, 1883.

J. TRIPP.

H. B. Baker, M. D.:

DEAR SIR,—I send you a diagram of the building and the grounds. The building was used for a hotel for 30 or 35 years. The privy was moved from place to place on the back line as fast as one vault was filled.

We found a leak in the drain between the catch-basin and stench-trap, so that the contents flowed back into the well. There were 25 cases of fever directly and indirectly from this source, and eight deaths. The diagram is correct, as it was made by actual measurement. My son, 16 years old, drew the plan.

I remain very truly yours,

Adrian, Mich., Sept. 17, 1884.

J. TRIPP.

FROM W. HARBECK, TEACHER OF THE GERMAN SCHOOL.

DEAR SIR,—Yours of the first has been received. I will try to answer your questions as near as I am able to. The name, age, residence of each scholar taken with the fever, and the physician attending to each case are :—

Name.	Age.	Residence.	Physician.
Ida Wagener.....	8	76 E. Maumee street ..	Dr. M. R. Morden.
Henry Baucrnfeind....	9	72 E. Maumee street....	Dr. W. Jewett.
Ida Rapp.....	7	6 E. Butler street .....	Dr. Ch. Lard.
Emma Loop.....	7	Country.....	Dr. R. Stephenson.
Henry Allabach.....	8	.....	No physician.
Ch. Betz.....	8	65 Frank street.....	Dr. Ch. Lard.
Luise Gippert.....	7	59 Frank street.....	Dr. W. Jewett.
Henry Backoff.....	8	17 Frank street.....	Dr. R. Stephenson.
Lina Goetting.....	8	95 Front street.....	Dr. Ch. Lard.
Anna Bohn.....	7	91 E. Railroad street....	Dr. Ch. Lard.
Martha Schmidt.....	7	100 Butler street.....	Dr. J. Piersol.
Charles Jennings.....	8	109 Butler street.....	Dr. Ch. Lard.
Friedericke Groeschow	9	— Hunt street.....	Dr. Ch. Lard.
Fritz Howe.....	9	50 Chestnut street.....	Dr. J. Tripp.
Minna Babs.....	8	76 Chestnut street.....	Dr. R. Stephenson.
Maggie Seiffer.....	7	71 Hunt street.....	Dr. R. Stephenson.
Luise Barger.....	7	9 Finch street.....	Dr. W. Jewett.
Arthur Wagester.....	7	23 Frank street.....	Dr. W. Jewett.
Martha Rabus (died)....	7	6 Finch street.....	Dr. R. Stephenson.
<i>The other patients using the well-water.</i>			
Peter Dietz.....	-----	— Frank street.....	Dr. W. Jewett.
Hattie Secord.....	10	64 Church street.....	Dr. C. H. Rynd.
Susan Chantrey.....	20	74 Church street.....	Dr. R. Stephenson.
Frank Niles.....	26	72 Church street.....	Dr. R. Stephenson.
Mrs. Frank Niles.....	-----	72 Church street.....	Dr. R. Stephenson.
George Mankins.....	27	72 Church street.....	Dr. R. Stephenson.
Pat. O'Riley.....	17	50 Elm street.....	Dr. R. Stephenson.

The young lady who died next door was Miss Lilly Black, 20 years of age. My wife is better, and my little Anna is recovering.

Yours truly,

Adrian, Mich., Nov. 5, 1883.

W. HARBECK.

FROM DR. M. R. MORDEN.

Dr. H. F. Lyster :

DEAR SIR,—In compliance with your request I send the following typhoid fever reports:

*Eda Wagner.*—Aged 8, German; attended the German school that you examined the premises of; went to bed October 2. *First week:* Symptoms all mild, but all present except diarrhoea; headache moderate: spots fifth day; tongue dry; appetite poor; cough slight; abdomen full; not very tense; slept fairly; mind clear, but irritable; bowels slightly constipated. *Second and Third weeks:* Slept generally well; headache at times, but decreased; mind clear, but more irritable, peevish and cross, and unreasonable; ate poorly, but wanted fried-cakes, cookies, and nuts, and all kinds of indigestible pastries; was held to milk and soups, but it was a hard matter to keep her up, on account of the small amount she would take; cough rather severe; urine no trouble; spots abundant; constipation marked. Will give only morning pulse and temperature each day: Temperature: 104° F., 104½, 103, 104½, 103½, 103¾, 104, 103½, 102¾, 103¾, 102¾, 103¾, 100¾, 103¾, 103, 102¾, 102¾, 102¾, 101¾, 103¾, 100¾. Respiration: 28, 30, 32, 36, 34, 36, 32, 38, 45, 48, 44, 34, 26. Pulse: 120.

120, 129, 120, 116, 112, 120, 114, 114, 118, 110, 118, 116, 116, 120, 116, 120, 110, 112, 110, 104. Convalescent in appearance, and pretty much every way after 17th day. Worst symptoms, poor feeding and irritability.

*August Hupner.*—Aged 11, German, attended a German school, near the one where you examined premises, but did not use water of well you examined; was a severe case; went to bed October 1. *First week:* Symptoms all mild, except headache, which was severe; symptoms all present except diarrhoea. *Second and third weeks:* Worst symptom stupor, which was continued and alarming, but no picking, no violent movement or motions, and only at times moderate muttering, mind a blank; appetite good; took milk and soup freely every three hours; constipation moderate; abdomen moderately swollen, spots, 5th to 15th days; cough moderate; urine, no trouble. Temperature: 103°, 103, 103, 105½, 104½, 105½, 104½, 104½, 104, 105½, 103½, 103½, 103½, 101½, 104½, 104, 104, 104, 103, 101, 101½. Respiration: 26, 28, 34, 36, 44, 48, 40, 48, 42, 38, 36, 32, 36, 36, 30, 30, 28, 30, 26, 24, 24. Pulse: 96, 96, 108, 112, 120, 112, 122, 120, 116, 112, 110, 114, 108, 114, 104, 102, 108, 96, 84. Convalescent after 17th day.

You will notice in both these cases absence of diarrhoea, and rather the opposite, viz., constipation, which I am inclined to believe is due to the plan of treatment adopted.

I have had five cases in country near the city, all mild; no other cases in town. Have had several cases near town, that started in like typhoid fever, but after a few days slow convalescence set in, for which I am not sure that plan of treatment deserves the credit, but patients and friends think that way.

Last year I had two cases, and saw another with Dr. Stephenson, near that school. There were seven or eight other cases right near by, and two or three died. Little note was made of it. You may not have learned of it. I laid it to what I call "Excrement-percolators," i. e. privy-holes near well. Often I see a whole back yard of water 6 to 12 inches deep, percolated through an old deep privy-hole. But I have preached and written on the matter till I am about ready to cool down, believing that our civilization is still a long, long way from the time when men would rather prevent disease than suffer disease, death, and doctor-bills. I believe that physicians here feel grateful to you for the kind interest you have taken in our affairs.

Respectfully yours,

M. R. MORDEN.

Adrian, Mich., November 13, 1883.

FROM DR. A. M. STEPHENSON—NOTES OF CASES.

CHART 1.

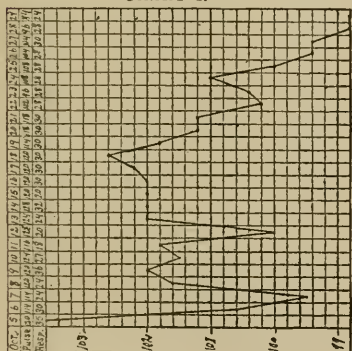
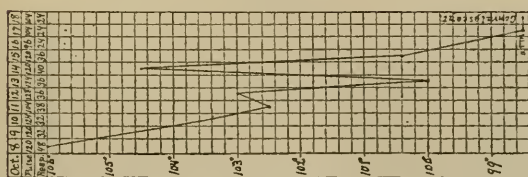


CHART 3.



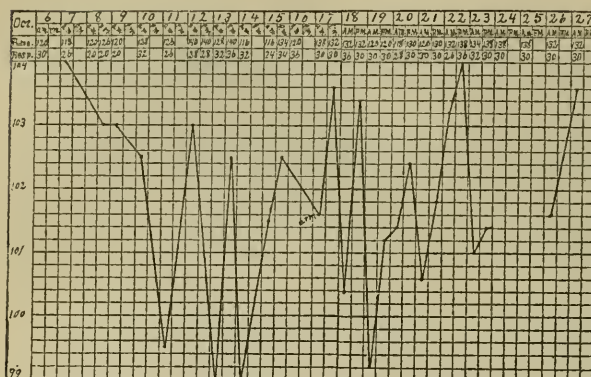
*Miss Susie Chantry.*—American, aged 20 years; lives in neighborhood of the German Lutheran School, and had used the water daily from the school-well. Uncomplicated case of typhoid fever, lasting twenty-four days, ending in recovery. Temperature, pulse, and respiration stated in Chart 1. Out-house sixty feet south, and wood-house forty-five feet southeast, from house; no sewer; slops thrown on the grass.

*Miss Maggie Seifer.*—German, aged 7 years, member of German Lutheran school; uncomplicated case of typhoid fever lasting 11 days, ending in recovery. See Chart 3. October 19, pulse 100, respiration 24; October 20, pulse 96, respiration 18. Out-house 30 ft.

N. E., and well 10 ft. N. W., from house; no sewer; slops thrown on the grass.

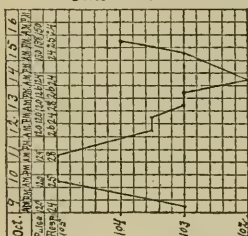


CHART 2.



*Miss Mina Bass.*—German, aged 7 years, member of German Lutheran school. Very severe case of typhoid fever, complicated with well-marked cerebro-spinal symptoms, and finally with furuncles, ending in recovery; fever lasted 24 days. Temperature, pulse, and respiration stated in Chart 2. Out-house 69½ feet and pigpen 68 feet south from house; well a little south from house. No sewer; a drain for slops empties into street.

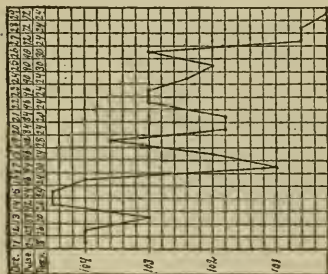
CHART 4.



*Martha Rabus.*—German, aged 6 years, member of German Lutheran School. Typhoid fever, complicated with cerebro-spinal symptoms; lasting about 9 days, ending in death. See Chart 4. Out-house 73 feet N. E., well a little E., from house; no sewer; slops thrown on the grass.

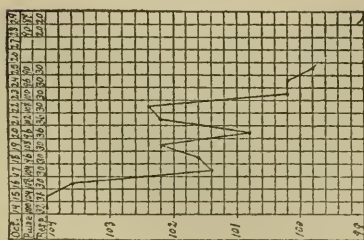
*Ernst Rabus.*—German, aged 9 years, member of German Lutheran School. Uncomplicated case of typhoid fever, lasting 9 days, ending in recovery. Oct. 9, pulse 100, respiration 20, temperature 102.2° F.; Oct. 10, pulse 83, respiration 20, temperature 101.4°.

CHART 5.



*Pat. Riley.*—Irish; worked in a cigar-factory, which was supplied with water from the school-well. Uncomplicated case of typhoid fever, ending in recovery. See Chart 5. Out-house 60 ft., and pigpen 87 ft. N. E. from house. No sewer; slops thrown on the grass.

CHART 6.



*Henry Backof.*—German, aged 7 years, member of German Lutheran School. Uncomplicated case of typhoid fever, lasting 16 days, ending in recovery. See Chart 6. Out-house 70 ft. N. E., and pigpen 59 ft. N. from house. No sewer; slops thrown on the grass.

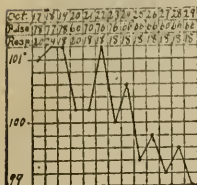


CHART 7.



*Miss Mina Loop.*—German, aged 7 years, member of German Lutheran School. Uncomplicated case of typhoid fever, lasting 10 days, ending in recovery. See Chart 7.

CHART 8.



*Geo. Mankins.*—American, aged 27 years. Lives in the neighborhood of German Lutheran School, and had used the water from the school-well daily. Uncomplicated case of typhoid fever, lasting 13 days, ending in recovery. See Chart 8. Out-house 37 ft. and woodshed 30 ft. S. from house. No sewer; slops thrown on the grass.

FROM DR. CHARLES H. LARDS.

DEAR SIR,—I received your card in regard to the fever cases, cause of this epidemic. The children complain of pain in the bowels, with some diarrhoeic stools; high fever. The temperature ranges from 100° to 104°; the pulse from 120 to 140. There is some delirium with pain in the head and soreness of the throat; in two cases there was some nose-bleed. I had in all eight cases. Two were forced to take the bed October 8; four, October 10; one, October 24; and one November 8. Recovery took place in two in 24 days; one, in 20 days; two, in 10 days; and one is on a fair way to recovery. The two last ones are very low yet.

The last one which was taken sick November 8, is a brother of Ana Bohn, the girl convalescent. The measure I used to limit its spread was I ordered the sick rooms well ventilated, the patient kept clean; and kept people away as much as possible. I had their beds well aired after the patients got up.

Very respectfully,

Adrian, Mich., Nov. 10, 1883.

CHARLES H. LARDS, M. D.

FROM DR. CHARLES RYND.

DEAR LYSTER,—Favor received. Sorry I did not see you while in Adrian. I did not treat the case of Hattie Secord. I am informed that Dr. I. K. Piersol had case in charge. I have no personal knowledge of the matter. I have heard, through Dr. Tripp, city physician, that two cases died in the neighborhood of the German school.

The disease is not spreading. I have now in charge two cases of typhoid, in one family, in western part of city, mother and boy—both doing well. I have also a case in western part of city, of erysipelas, with typhoid symptoms, now under control. I have a few other cases on hand in various parts of city, mild in their character. There is no tendency to spread of epidemic here.

I have advised our people to remove the nuisance of "privy vaults," put in boxes or pails, and have them removed as often as necessary, if need be at public expense. Adrian is a comparatively old place—nearly sixty years. A large accumulation of morbid matter will certainly produce deleterious results. Should you so desire I will write you more fully on this matter.

Kindly,

Adrian, Mich., Nov. 9, 1883.

C. RYND,

The result of the inspection was that we found an outbreak of true enteric fever, apparently of spontaneous origin, and not dependent upon any anterior case. The fact that it was wholly confined to persons making use of the water of one well, and that the large majority of the patients were under the age of greatest susceptibility to the specific typhoid poison, and were affected on account of their exposure to the poisonous water, is one which it would be difficult to subvert. The fact that the epidemic did not spread beyond those who took the disease at its original source is a somewhat exceptional experience with typhoid fever; and while not strong enough to throw any doubt upon the character of the disease, yet marks a peculiarly exceptional instance of freedom in this endemic outbreak from the much feared epidemic characteristic of infection.

The practice of the physicians had been to a greater or less degree in favor of cleanliness, and of disinfection of the stools. It may have been rather more

generally observed than usual by the majority, but I do not believe that there was more thorough compliance with these methods than is usually the case; and yet the disease did not spread by infection to a single person. According to the generally accepted theory of the wonderful development of the specific poison of typhoid when introduced into a community, this nucleus should naturally have been the beginning of a general outbreak in the city, especially as it occurred in the early autumn when fever, particularly fever of this type, prevails in the town and country, after the long impression of the summer heat and the production of malarial poison, the wells being low and the water not of the best quality. Some important factor was wanting at this time, and with the convalescence of the last little patient the disease disappeared completely, leaving only a lesson behind it, showing the necessity of protecting the water-supply. This problem has been occupying the attention of the authorities of Adrian for some time, and we hope that the outcome of their efforts will be gratifying to them.

During the printing of this paper the secretary of the State Board of Health called my attention again to the statement in Dr. Morden's letter (on page 43) that there were cases of typhoid fever in 1882 in the vicinity of this school, and I wrote to Dr. Morden for further particulars, as follows:—

MICHIGAN STATE BOARD OF HEALTH, }  
*Detroit, Oct. 22, 1884.* }

DEAR SIR,—Dr. Baker, secretary of the Board of Health, is not a believer in the spontaneous origin of that outbreak of typhoid fever of last fall at Adrian, and quotes your letter to me in which you state, "Last year (i. e. 1882) I had two cases and saw another with Dr. Stephenson, *near that school*. There were seven or eight cases right near by, and two or three died." Will you write me the exact facts in the case? *How* near the school-house were they? The date of their occurrence? Was there a possibility of the well having been contaminated by them by soakage through the soil? etc.?

Yours very truly,

M. R. Morden, M. D.

HENRY F. LYSTER, *Committee.*

To this letter Dr. Morden replied as follows:—

*Adrian, Mich., Oct. 23, 1884.*

*Dr. H. F. Lyster, Detroit, Mich.:*

DEAR SIR,—I think I recall writing such a statement, which my memory somewhat fully corroborates. I now think that Dr. Stephenson had six or eight, and perhaps nine cases in the neighborhood indicated. The region referred to could be perhaps best described by stating that the hotel (now school) is situated in the center of the north line of a square, about 40 rods on a side, that is 1,600 square rods. Of course you understand that such a region has no reference to city blocks or streets, but in reality it does comprise about six squares. The privy-vaults in this region are large and numerous. During dry seasons I have seen vaults that I think contained over a ton of semi-liquid excrements, on the surface of which maggots "swarmed." The stench at night in that, as in many other (and better) regions of our city is frightful. With me it occasionally produces vomiting when passing at late hours, on foot. Nor is the source of such mischief all visible, as my lot has a number of old vaults covered in, the result of removing privies from a full vault, and digging a new one. Hence, the whole region has its back yards honey-combed with privy-vaults. In the late fall and early spring, and during winter thaws, I have seen back yards like large ponds of water; and the privy-vaults seemed to be the funnels by which it escaped, thus carrying on a process of percolation through them. When I contemplate these facts and many others I will not now stop to consider, I am often inclined to become skeptical as to the dangers of privy infection either by air or water; for with such gross carelessness, and abominable filthiness even among many of our best people, I cannot understand how it is that anybody escapes, if such things are as dangerous as sanitarians and others claim them to be. For nine years I have written many articles to our papers, have labored hard with my patrons and others on the matter of using dry earth in closets, and of never allowing excrements to fall or accumulate below the surface. A goodly number have heeded my advice, and I am convinced that municipal legislation could be easily made triumphant over the privy-evils in a town like this by supplying, and enforcing the use of dry earth. In regard to the contamination of the school well, I have no doubt; but I also think that polluted air, occasioned by vile privy-vaults, is also a prominent factor in producing what few cases of fever we have here. On account of the water-works trenches last year I believe we suffered more severely than we otherwise would. I had two cases of typhoid fever,

very severe, last year, that attended a German school near by the one referred to, but did not partake of the water from the distrusted well.

I do not remember now the house in which I understood two died, but it is in the region described. Probably Dr. Stephenson could give you more definite information. The two cases I attended two years ago were on the western side of the said region. The case I saw with Dr. Stephenson was right by the said school. There were two or three cases in the same house.

Respectfully yours,

M. R. MORDEN.

The problem of the removal of the waste-matter of all kinds from the city, and the giving up of the storage plan in vaults and cesspools, must receive attention; and the little German school has taught something outside of the curriculum. It remains to be seen whether the public will profit by it, or whether it will require a repetition. Adrian is going to last a great many years, and the experience it has had it will have again and again, just so sure as nature's laws are unchangeable.

## PREVENTION AND RESTRICTION OF CHOLERA.

DOCUMENT ISSUED BY THE MICHIGAN STATE BOARD OF HEALTH.  
JULY, 1884.

*To the Officers and Members of Local Boards of Health in Michigan:—*

GENTLEMEN:—The increase of cholera in certain parts of Europe, the probability that it may be brought to the larger cities of this country, and spread from them, or that by some traveler, immigrant, or returning tourist it may be brought to almost any town in this State even before it appears on the seaboard,\* make timely the publication of what seem to be the best means of preventing and restricting the disease.

### PROPER DIRECTION OF EFFORTS.

Asiatic cholera is not caused by anything ordinarily in this State or country, therefore efforts for its prevention or restriction should be directed especially toward the prevention of the introduction of that invisible cause of the disease which is produced in and spread by each infected person; and in case the disease shall reach your locality, to the restriction and destruction of that cause with the greatest possible haste and thoroughness.

\* In 1873 something like this occurred. Three distinct outbreaks of cholera in widely remote parts of the United States were traced to the unpacking of personal effects of immigrants who had come to New York city on uninfected vessels, exciting no suspicion there that they carried the infection of cholera. Within thirty-six hours after they unpacked their effects, the first cases of the disease occurred. This was at Carthage, Ohio; Crow River, Minnesota; and Yankton, Dakota. Small-pox was recently brought into Wisconsin by German immigrants who came on steamer Salicr, landing at Baltimore May 15, reaching Black Creek, Wis., May 19, and taken sick May 21, 1884. Small-pox has also just been introduced into Shelby county, Iowa, in a similar manner, by immigrants who came through Baltimore. Small-pox was recently brought to LeRoy, Michigan, by an immigrant who left Bremen, on steamer Weser, May 22, landed at New York June 4, reached LeRoy June 9, and was taken sick June 8, 1884.



Even now, by a cleaning up of filthy places, most communities can be put in better condition to control and destroy the infection of cholera should it be introduced. But when cholera appears something must be done besides cleaning up.

#### WHO WILL KEEP IT OUT OF YOUR JURISDICTION?

By reason of the tide of immigration, this country is especially liable to the introduction of communicable diseases; and by reason of its exceedingly imperfect support of the National Board of Health, the National Government supplies little or no protection to the public health by means of any system of notification, inspection, disinfection, etc., such as the National Board of Health might be enabled to supply; and inasmuch as all quarantine powers in this State are vested in the local boards of health, it behooves local boards of health to be prompt to act and continue persistent in action, so far it is possible, for the prevention of the introduction of cholera\*. So little can be hoped for, however, from irregular local quarantines, that every board of health should also be prepared to restrict the disease. Newly-arrived immigrants should be under the surveillance of your health officer.

#### CAUSE OF THE DISEASE.

Recent microscopical and experimental researches in Egypt and Calcutta, made at the expense of the German government, by Dr. Robert Koch, one of the most successful detectives of disease-causing germs, seem to demonstrate, what general observation of the disease had already indicated, that Asiatic cholera is caused by the growth and reproduction in the body of innumerable bacilli or one-celled plants of a kind peculiar to this disease, invisible to the naked eye; that these bacilli may enter the body by the air inhaled, but are far more likely to enter by food or drink taken into the stomach; that they are present in the excreta of a person sick with cholera, and in his clothing soiled thereby, and may be on almost everything that comes in contact with his body.

#### PREPARATIONS TO RESIST CHOLERA.

There is probably nothing in Michigan from which cholera germs can be developed; but there are many places in which they might thrive and reproduce when once introduced from abroad.

The investigations by Dr. Koch shows that the bacillus of cholera can live and reproduce its kind indefinitely in certain, but not in all substances outside the body, namely, in certain alkaline but not in acid solutions; and as the normal condition of the stomach is acid, that it cannot live in the human stomach in its normal condition. The intestinal juices being normally alkaline, the bacillus can, probably, reproduce itself therein without limit whenever it can pass through the stomach. This makes it of especial importance that in times of danger from cholera, the stomach should be kept in its naturally good condition.

Because of the possibility that the cholera bacillus may find lodgment and multiply in various kinds of moist filth, it is important that everything about

\*Sections 1708 to 1712 inclusive, and section 1695 of the Compiled Laws of Mich., 1871, give local boards of health authority in certain manner to inspect and restrain travelers, remove infected persons, and take possession of and disinfect baggage, goods, premises, and to make regulations respecting articles capable of conveying infection. Sections 1706 and 1707 require the board of health to "make effectual provision" for the safety of the inhabitants whenever a disease which endangers the public health shall occur within its jurisdiction.



the house, cellars, barns, premises, alleys, and streets, should be cleaned up and kept dry, and as clean as possible, and that there should be a general disinfection of all places liable to become infected. Especially should privy-vaults, sewers, cess-pools, drains, and similar places, be thoroughly and often disinfected with a strong solution of copperas, which may be made acid by the addition of sulphuric acid. The cholera bacilli are said to thrive in nutritive alkaline solutions, and the contents of most privy-vaults are alkaline; hence the importance of such thorough and frequent disinfection as shall kill any of the germs which may find lodgment there.

#### RESTRICTION OF CHOLERA.

One of the chief means of restricting cholera is to disinfect immediately and thoroughly all the discharges from those sick with cholera, or with the premonitory diarrhea, and to disinfect or burn at once completely all their cast-off clothing, bedding, etc.

The fecal discharges are not as infectious when first voided as they soon become, hence the importance of immediate disinfection. Thrown without disinfection into a privy-vault, cess-pool, or sewer, the fluids vomited, and especially the discharges from the bowels of a cholera patient may soon infect all its contents, and render it a source of infection to those who approach.\*

All the discharges from the body,—the vomit, the discharges from the bowels, etc., should be received into vessels containing some concentrated disinfectant, such as chloride of zinc, copperas, or sulphate of zinc, to which may be added sulphuric or other mineral acid.

Clothing soiled by a cholera patient, if laid aside and allowed to remain moist, soon becomes especially dangerous. It is, therefore, important that all such articles be immediately burned or placed in a strong disinfecting solution until such time as they can be burned, or boiled, washed, and dried. (Dr. Koch's experiments indicate that the bacilli of cholera are destroyed by being thoroughly dried for three hours or more.)

The diarrhea preceding cholera is frequently painless, and there is, therefore, during the occurrence of cholera, great danger of cholera being spread by the discharges of persons yet able to travel about.\* During the first stages of cholera, and especially during the initiatory diarrhea, prompt medical treatment is important and useful, both for the benefit of the individual and as a means of checking the spread of the disease.

It has been a practice in England, and should be the practice everywhere, when a man is found sick with cholera, to learn by inquiry what privies he has visited, and at once send an officer on the back track to disinfect them. For reasons just stated, notice should at once be sent to the board of health of a locality from which a case of cholera has come.

Great care should be had to prevent the contamination of the water-supply by choleraic discharges, as by drainage into wells, springs, or other water-supply, from a privy-vault, sewer, drain, or cemetery. The use of water from a source liable to be infected with cholera excreta should be promptly stopped.

Bodies of those dead from cholera should be wrapped in a cloth wet with a

\* In 1873, a colored boy went to Columbia, Ky., from Lebanon, Ky., where the county fair had been held, and where cholera was then present. He suffered from diarrhea, and used a privy which was large and full, but from which no sickness had previously been traced. He was found in a state of collapse, and died in the stable. Nearly every person who entered that privy within a few days thereafter was taken sick with cholera. Farmers who came in from the country and only visited it once were stricken with cholera. The privy was disinfected, after which no cases were traced to it.

zinc solution, and at once buried: the zinc solution to be made in proportions as follows: water, one gallon; sulphate of zinc, eight ounces; common salt, four ounces.

#### DISINFECTION OF CLOTHING, ROOMS, ETC.

It is best to burn all articles which have been soiled by a person sick with cholera. In the glowing fire of a large furnace is a good place to burn clothing. Great care should be taken to burn quickly and thoroughly whatever is burned, and not simply warm up and spread the infection.

Articles too valuable to be destroyed should be exposed for one hour to a dry heat of from 240° F. to 250° F., or three hours at a temperature of 150° F., or be treated as follows:—

Cotton, linen, flannels, blankets, etc., should be treated with the boiling-hot zinc solution (one-half of the strength of that mentioned in the preceding paragraph), introducing them piece by piece, securing thorough wetting and boiling for at least half an hour. Heavy woolen clothing, silks, stuffed bed-covers, beds, and other articles which cannot be treated with the zinc solution, should be hung in the room during fumigation, pockets being turned inside out, and the whole garment being thoroughly exposed. Afterward they should be hung in the open air, beaten, and shaken. Carpets are best fumigated on the floor, but should afterward be removed to the open air and thoroughly beaten. In no case should the thorough disinfection of clothing, bedding, etc., be omitted.

After a death or recovery from cholera, the room in which there has been a case of cholera, whether fatal or not, should, with all its contents, be thoroughly disinfected by exposure for several hours to strong fumes of burning sulphur, and then it should for several hours, if possible for days, be exposed to currents of fresh air.

Because of the innumerable ways in which the infection may be scattered about the house and premises where there has been a case of cholera, the entire house and out-buildings, including cellar, woodshed, and privy, may well be disinfected.

Rooms to be disinfected must be vacated. For a room about ten feet square, at least two pounds of sulphur should be used; for larger rooms, proportionately increased quantities, at the rate of two pounds for each one thousand cubic feet of air-space.

Close the rooms as tight as possible, place the sulphur in iron pans which will not leak, supported upon bricks, or over a sheet of zinc, set the sulphur on fire by hot coals or with the aid of a spoonful of alcohol lighted by a match, be careful not to breathe the fumes of the burning sulphur, and when certain the sulphur is burning well, leave the room, close the door, and allow the room to be closed for twenty-four hours.

Privies, cess-pools, drains, water-closets, sewers, gutters, etc., should be frequently and liberally treated with copperas solution made in the proportion of one and one half pounds of copperas to one gallon of water.

#### CARE OF THOSE SICK WITH CHOLERA.

The law (section 1706, Compiled Laws of 1871) requires the local board of health to provide nurses, if necessary. There is no excuse for failure to care for those sick with cholera. They are less dangerous to the community if well cared for than if neglected. A careful nurse will frequently wash the hands in a disinfecting solution, and always avoid taking into his body with his

breath, food, or drink, any dust or fluid contaminated with any of the excreta from one sick with cholera. Neither food nor drink should be taken by the nurse while in the room with a person sick with cholera. If there is possibility of the infection of the water, it should be boiled before it is drank. By proper attention to cleanliness, ventilation, disinfection of discharges, and of whatever has been in contact with the sick, and by taking proper care as regards kind of food, regular eating, rest, and sleep, and especially by guarding against taking the specific cause into the body, with his breath, food, or drink, a person in good health may nurse a cholera patient with a reasonable expectation of escaping the disease.\*

#### LEGAL DUTIES,—PROMPT NOTICES OF OUTBREAK.

The duty of householders and of physicians to give the local board of health prompt notice of the first and of every case of a disease dangerous to the public health, and of the board of health and the health officer to take prompt measures for the restriction of the disease, have been so fully and so often set forth in circulars from the State Board of Health that they need not be repeated here in connection with so dangerous a disease as is cholera.

Notice should at once be sent, on the first appearance of cholera, to the Secretary of the State Board of Health, Lansing, Mich.

AFTER READING THIS DOCUMENT CAREFULLY PLEASE PRESERVE IT.

A copy may be obtained of the *State Board of Health, Lansing, Michigan*.

## CHOLERA IN ITS RELATIONS TO RAILROADS.

MICHIGAN STATE BOARD OF HEALTH,  
Office of the Secretary, Lansing, Michigan, August 1, 1884. }

Gen. Wm. P. Innes, Commissioner of Railroads of the State of Michigan :

DEAR SIR,—In compliance with your request for recommendations of measures for the prevention and restriction of cholera, suitable for instructions to station-agents, conductors, and other officers of railroads in Michigan, I have prepared the following suggestions, entitled "Cholera in its Relations to Railroads," which have been submitted to and approved by members of the State Board of Health, and are herewith respectfully submitted for your consideration. In connection therewith are enclosed copies of a circular on cholera addressed by this Board to officers and members of local boards of health in Michigan, of which, if you wish them, I can supply sufficient copies for all railroad officials in the State. I have no doubt that railroad managers will be found ready to co-operate in measures for the restriction of cholera in case it should be brought into this country, and in all reasonable measures now for lessening our liability to outbreaks of this dangerous disease.

Very respectfully,

HENRY B. BAKER, *Secretary*.

#### CHOLERA IN ITS RELATIONS TO RAILROADS.

Cholera may be carried by a person (in his intestines), and probably by infected clothing, baggage, etc. If cholera is introduced into Michigan, it will probably be by some person traveling by railroad, who may be taken sick before getting off the train. It is, therefore, important both for their own safety and for that of the public that all railroad employees shall have clear ideas of the best means of restricting cholera.

\* "That cholera patients are not dangerous to their attendants has been proved in this epidemic in the Military Hospital, where not a single attendant has suffered from the slightest choleraic diarrhea."—Port's report to Cholera Commr. for the German Empire, on the epidemic of 1873-4 in the Garrison of Munich.



Cholera seems to be caused by a special poison associated with a living *bacillus*, invisible to the naked eye, which, when once introduced, reproduces itself with extraordinary rapidity in the intestines of man, in nutritive alkaline solutions, in moist filth, moist clothing, etc.

To prevent cholera we must prevent the introduction into the body of the specific germ or poison. Though in a perfectly healthy stomach the germs of cholera may be killed before reaching the intestine, it is not safe to trust too much to the resisting powers of nature, because the taking in of a large number of cholera-germs might cause the disease in a person in perfect health. The cause of cholera is probably destroyed by thorough and long-continued drying, by great heat, and by several ordinary disinfectants. Thorough exposure to the fumes of burning sulphur will probably destroy it.

1. Everything about the premises, alleys, and streets around depots should be cleaned up and kept dry, and as clean as possible, and there should be a general disinfection of all places liable to become infected. Especially should privy-vaults, cess-pools, sewers, drains, and similar places be thoroughly and often disinfected with a strong solution of copperas (one and one-half pounds of copperas to one gallon of water) which may be made acid by the addition of sulphuric acid. The cholera bacilli are said to thrive in nutritive alkaline solutions, and as the contents of most privy-vaults are alkaline, it is important that there be such thorough and frequent disinfection of privies as shall kill any of the germs which may find lodgment there. As a precaution, this should be commenced at once. By a free use of dry earth (road dust from a clay road) many dangerous places may be improved.

2. Great care should be had to prevent the use of water contaminated with choleraic discharges, or otherwise rendered impure. Such contamination may occur by soakage from privy-vaults, and in other ways too numerous to mention, and which only intelligent care, both at stations and on the cars, can guard against.

3. At lunch-rooms and eating-houses care should be had to prevent contamination of food or fruits. The utmost cleanliness should be required on the part of all servants and attendants. Not only the water used for drinking and cooking, but that used in washing dishes should be from a source entirely free from suspicion.

4. Especial care should be taken that the water carried on the cars comes from a source free from any suspicion of contamination. Water-coolers should not stand and be filled in car-closets, because the air in the privy will then come constantly in contact with the water, the foul air being drawn into the cooler as the water is drawn out to be drank. Especial care should be taken to keep closets on cars clean and dry.

5. Great attention should be paid to the bedding in sleeping cars, and to the upholstery of seats wherever there is a possibility of contamination by choleraic discharges. Such contaminated articles should at once be burned.

6. Cars which may have become infected should at once be emptied of well passengers; and, as soon as possible, be thoroughly disinfected. As soon as emptied of passengers, an infected car should, first, while tightly closed, be exposed for several hours to the fumes of burning sulphur, using at the rate of two pounds of sulphur for each one thousand cubic feet of air space. It should afterwards be thoroughly aired, and made perfectly dry throughout.

7. If cholera occurs here, it may be best for trunk lines to run a hospital car with each train so that if a passenger is taken sick he may at once be removed and avoid risk to other passengers; or that all trains have cars suffi-

cient so that one car may at any time be emptied and devoted to any persons who may be taken with cholera.

8. Agents and conductors should at once notify the health officer or local board of health\*, of a case or a suspected case of cholera on a train or at a station, and should keep watch of such a person until he is placed in charge of the proper authorities. Care should be taken to learn what privies the patient may have used, and where he may have used the car privy, and a suitable person should at once be sent on the back track, and notice be given by telegraph, to disinfect all discharges which may be found and all privies and privy-vaults which may have been used by him.

9. Notice of a suspected case of cholera, and of what has been done with regard to it, should also at once be sent to the Secretary of the State Board of Health, at Lansing.

A copy of a circular addressed to local boards of health, on restriction and prevention of cholera, will be sent to any railroad officer or employee on application to the Secretary of the State Board of Health, Lansing, Michigan.

HENRY B. BAKER, M. D., *Secretary.*

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## EXAMINATION OF TEXT-BOOKS ON PHYSIOLOGY AND HYGIENE.

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REPORT BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

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In 1883 the Legislature amended section 15 of chapter III of Act No. 164, Laws of 1881, to read as follows:—

From Chapter 3 of Act No. 164, Laws of 1881, as amended by Act 93 of 1883.

SECTION 15. The district board shall specify the studies to be pursued in the schools of the district: *Provided always*, That provision shall be made for instructing all pupils in every school in physiology and hygiene, with special reference to the effects of alcoholic drinks, stimulants, and narcotics generally, upon the human system: *Provided further*, That the text books used in giving the foregoing instruction shall have received the joint approval of the State Board of Education and State Board of Health. The said district board shall prescribe the text-books to be used which shall be uniform in each subject that may be taught; but text-books once adopted, under the provisions of this act, shall not be changed within five years, except by the consent of a majority of the qualified voters of the district present at an annual meeting. Each school board, making a selection of text-books under this act, shall make a record thereof in their proceedings.

In answer to an inquiry addressed to the Attorney General as to whether this section requires approval by the boards of Education and Health of all text-books used in district schools for instruction in physiology and hygiene, or only of such as may be designed for instruction in said subjects with "special reference to the effects of alcoholic drinks, stimulants, and narcotics generally, upon the human system, the following opinion was received:—

STATE OF MICHIGAN,  
Attorney General's Office, Lansing, Dec. 26, 1883. }

Henry B. Baker, M. D., *Secretary State Board of Health:*

DEAR SIR,—Yours of this date relative to the proper construction of Sec. 15, Chap. III, Act 164, laws of 1881, as amended by Act No. 93, laws of 1883, is at hand, and in reply would say, that the

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\* There is a board of health in every city, village, and township in Michigan.

clear intent of the Act is that instruction shall be given in the schools in physiology and hygiene, "with special reference to the effects of alcoholic drinks, stimulants, and narcotics generally, upon the human system," and that all text-books used *for such purpose* must receive the *joint* approval of the State Board of Education and the Board of Health.

Books may be used to teach physiology or hygiene, but unless they also include the teachings of the effects of alcohol, etc., as provided in the statute, they need no approval. As soon, however, as books are sought to be introduced covering the effects of alcohol, etc., they must, before using, have the joint approval of the two boards.

Books on physiology and hygiene generally, need no approval or censorship, but when they propose to treat upon the influence of alcohol upon the system it can readily be seen that unless the approval of some competent and reliable board was necessary, a class of books might be introduced in some sections that would hardly meet the views of those who are opposed to the use of alcoholic liquors in their various forms, and hence the requirement that books treating of the effects of alcohol, etc., should first be approved.

Yours truly,

J. J. VAN RIPER, *Attorney General*.

At the request of members of the State Board of Health a second inquiry was addressed to the Attorney General, as to whether books on physiology and hygiene giving instruction in effects of alcohol and narcotics, require examination and approval as a whole as text-books in physiology and hygiene, or require examination and approval only with reference to their instruction in the effects of alcohol and narcotics, the following reply was received:—

STATE OF MICHIGAN,  
*Attorney General's Office, Lansing, January 8, 1884.* }

*Henry B. Baker, M. D., Secretary State Board of Health:*

DEAR SIR,—In reply to your communication of to-day, permit me to say, that I am of the opinion that the approval of the respective Boards of Health and Education is required only upon so much of books for instruction in physiology and hygiene as relate to the effects of alcoholic stimulants and narcotics generally upon the human system.

Yours truly,

J. J. VAN RIPER, *Attorney General*.

At its regular quarterly meeting April 8, 1884, one book was approved by the State Board of Health, without qualification, namely: "The Human Body: An Elementary Text-book of Anatomy, Physiology, and Hygiene, By H. Newell Martin, D. Sc., M. A., M. D. Second Edition, revised; to which is added a Special Chapter on Alcohol and Narcotics, New York: Henry Holt & Co., 1884;" and one book was approved with the qualification that "it contains a few inaccuracies," namely: "Alcohol: Its Effects on Body and Mind, By Eli F. Brown, M. S., M. D. Normal Publishing House, Indianapolis, Ind., 1883."

At its regular quarterly meeting, July 8, 1884, the following resolution was adopted by the State Board of Health, approving with a qualification the books therein named:—

*Resolved*, That while we cannot recommend without qualification, any of the books presented to this Board for examination, with the exception of those already acted upon, on account of numerous and important errors and omissions, the following works seem to us to be admissible for use in the schools, although we consider it important that the errors referred to should be eliminated as speedily as possible, and that without such correction none of the works named can receive the entire approval of this Board:

1. Physiology and Hygiene, By J. C. Hutchison, M. D., LL. D., New York: Clark & Maynard, Publishers. Edition of 1884, with Supplement on Stimulants and Narcotics.

2. The Laws of Health: Physiology, Hygiene, Stimulants, Narcotics. By J. C. Hutchison, M. D., LL. D. New York: Clark & Maynard, Publishers.

3. Hygienic Physiology, with special reference to the use of Alcoholic Drinks and Narcotics. By J. D. Steele, Ph. D. A. S. Barnes & Co., Publishers, New York and Chicago.

4. Lessons on the Human Body: An Elementary Treatise upon Physiology, Hygiene, and the Effects of Stimulants and Narcotics on the Human System. By Orestes M. Brands. Leach, Shewell & Sanborn, Publishers, Boston and New York.



5. First Lessons in Physiology and Hygiene, with special reference to Alcohol, Tobacco, and other Narcotics. By Chas. K. Mills, A. M., M. D., Philadelphia. Eldredge & Brother, Publishers, 1884.

6. Elements of Physiology and Hygiene. By R. T. Brown, M. D. Van Antwerp, Bragg & Co., Cincinnati and New York.

7. The Eclectic Physiology for use in Schools. By Eli F. Brown, M. D. Van Antwerp, Bragg & Co., Publishers, Cincinnati and New York.

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## DISEASES IN MICHIGAN IN THE YEAR 1883.

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BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

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This paper continues a study of diseases in Michigan, begun in the Report of the State Board of Health for 1876, in relation to diseases in 1875, and continued for subsequent years in subsequent Reports of the Board. At the end of each year a circular of inquiry has been sent to the regular correspondents of the Board, with a blank form for reply, in relation to the sickness in that year. The replies for each year have been summarized, and published. For 1883 replies were received from 24 correspondents. The circular for 1883 follows herewith in small type. After each question is printed in larger type a summary of the replies to that question. The replies, arranged alphabetically by names of localities, in each of the nine divisions of the State from which replies were received, follow the abstract from replies to the last question. Thanks are due to correspondents for their care in making replies; and it is hoped that they will continue to record observations and that other correspondents will record observations by which they can make useful replies to the circular in coming years.

### CIRCULAR TO CORRESPONDENTS, RELATIVE TO DISEASES IN [67] MICHIGAN IN 1883.

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OFFICE OF THE STATE BOARD OF HEALTH,  
Lansing, Michigan, December, 1883. }

*To the Correspondents of the State Board of Health:*

GENTLEMEN,—This Board desires to have, and to place upon record for purposes of future study and comparison in connection with records of deaths and of meteorological conditions, statements for as many different localities in the State as possible of the diseases in Michigan during the year 1883. Will you have the kindness to send as soon as is convenient, and on this sheet, your replies to the following questions? So far as exact and generally accepted common terms can be used, it is desirable to avoid the use of technical terms. Please use the stamped envelope enclosed herewith, and leave all additional postage to be paid at this office. In replying, it is desired that you fill the blanks in this Circular; if the blank space is not sufficient for your answer, please refer to and use an extra sheet, referring to the question by number.

As stated after question 17, in the absence of positive knowledge, opinions are desired. The fact that it will be difficult, and sometimes impossible, to give the information asked for is well understood; the importance of the subject, however, warrants the request that each correspondent will take the care necessary to give definite replies to all the questions. The great value of a compilation of such replies must be conceded. Inasmuch as a similar circular will probably be issued for 1884, it would facilitate replying to that circular and add to the value of the replies, if correspondents would, during the year, make a record of facts concerning the prevalence of diseases,

concerning meteorological conditions, and concerning soil moisture and ground water observed during the year. It is believed that in this way may be accumulated data which eventually will be of great value to the people. To facilitate such records, an extra copy of this circular is sent to you.

By direction of the State Board of Health.

Very respectfully,

HENRY B. BAKER, *Secretary.*

## QUESTIONS AND SUMMARY OF REPIES.

### THE ESTIMATED DEATH-RATE IN MICHIGAN IN 1877-83.

1. If you live in a city or incorporated village, what do you estimate the number of inhabitants of said city or village at the middle of the year 1883?
2. Among these inhabitants above mentioned, what do you estimate the number of deaths from all causes during the year 1883?

There were 22 replies received to question 1. Four replies related to the population of townships; 9 to that of villages; 5 to cities; 2 to villages and townships together, and one to a city and suburbs. One gave the population of the Michigan Asylum for the Insane at Kalamazoo. To question 2, replies were received from 5 townships, 8 villages, and 4 cities; 1 reply was for a village and township together, one gave the number of deaths occurring in a city with its suburbs, and one the number of deaths at the Michigan Asylum for the Insane. Replies to both questions 1 and 2 were received from 19 correspondents. From these 19 localities, having a known or estimated population of 225,119, the total number of deaths returned was 3,630; making an annual death-rate of 16.12 in 1,000 inhabitants. Excepting at the Michigan Asylum for the Insane, the highest death-rate reported was at the village of Walled Lake. In the village of Hersey, with a population of 350, no death occurred in 1883. In the township of Fairbanks, with a population of 2,500, the death-rate was less than 2 in 1,000 inhabitants. The following table exhibits the replies received to questions 1 and 2, from each locality, and the death-rate per 1,000 inhabitants calculated from the numbers returned. The table on page 57 gives a comparative exhibit of the death-rates reported for the years 1877-83.

3. Please state the territory for which your replies to following questions are made?

The localities represented in the replies are situated in 20 counties in 9 geographical divisions of the State. A list of the divisions with the counties in each division is printed in Exhibit 1, page 59.

4. Among the people of your locality, considering the increase or decrease of population, was the amount of sickness from all causes during the year ending December 31, 1883, *greater, less, or about the same as the average* during previous years? If not the same, how much was it increased or diminished?

Each of the 24 correspondents who replied to the circular replied to this question. Nine correspondents reported the amount of sickness in their locality to be about the same as usual; 4 that it was more, and 11 that there was less sickness than usual. One reported that the increase in sickness was 25 per cent; another, that it was 10 per cent; and another, 20 per cent. Of the eleven correspondents who stated the relative decrease of sickness, six reported it to be at least one-third less than usual; the average decrease reported is 35 per cent. Comparing the year 1883 with other years, of the correspondents who replied to this question for each year mentioned, the proportion which reported an increase of sickness was,—in 1879, 29 per cent; in 1880, 20 per cent; in 1881, 43 per cent; in 1882, 14.8 per cent; and in 1883, but 17 per cent. The proportion which reported a decrease in each year was,—in 1879, 39 per cent; in 1880, 20 per cent; in 1881, 17 per cent; in 1882,

[ Continued on page 60.]

TABLE—Exhibiting Names of Localities from which Replies to Questions 1 and 2 were Received, the Estimated Population, the Number of Deaths Reported, and the Average Deaths per One Thousand Persons Living, for each Locality for the Year 1883.

DIVISIONS AND LOCALITIES.*	City, Village, or Township.	Estimated Population.	Deaths Reported.	Deaths per 1,000 Persons.
<b>UPPER-PENINSULAR DIVISION.*</b>				
Fairbanks.....	Township.....	2,500	4	1.6
Sherman.....	Township.....	1,000	12	12.
<b>NORTHERN DIVISION.*</b>				
Mackinaw City.....	Village.....	500	-----	-----
<b>NORTHWESTERN DIVISION.*</b>				
Bear Lake.....	Village and Township....	800	-----	-----
<b>WESTERN DIVISION.*</b>				
Wyoming.....	Township.....	2,200	15	6.8
Hersey.....	Village.....	350	0	0
<b>BAY AND EASTERN DIVISION.*</b>				
Sanilac.....	Township.....	-----	9	-----
Saginaw.....	City.....	16,000	191	11.9
<b>CENTRAL DIVISION.*</b>				
Roxand.....	Township.....	200	5	25.00
Hastings.....	City.....	2,800	30	10.7
Vermontville.....	Village.....	800	20	25.00
<b>SOUTHWESTERN DIVISION.*</b>				
Asylum for Insane (Kalamazoo).....	-----	919†	31	33.7
Niles.....	City.....	4,000	-----	-----
Otsego.....	Village.....	1,200	16	13.3
<b>SOUTHERN-CENTRAL DIVISION.*</b>				
Brooklyn.....	Village.....	600	4	6.6
Mendon.....	Village.....	900	22	24.4
Union City.....	Village.....	1,400	22	14.3
Ypsilanti.....	City.....	6,000	75	12.5
<b>SOUTHEASTERN DIVISION.*</b>				
Detroit.....	City and Suburbs.....	180,000	3,100	17.2
Milford.....	Village and Township....	3,300	22	6.7
Northville.....	Village.....	1,200	7	5.8
Walled Lake.....	Village.....	150	4	26.7
Wyandotte.....	City.....	3,600	50	13.9

\* For counties in each division, see Exhibit 1, page 59.

† Of this number 759 were patients among whom there were 30 deaths, giving a death-rate of 39.5 per 1,000.

TABLE, Exhibiting the Estimated Population, the Estimated Number of Deaths, the Average, Highest, and Lowest Death-rates, and the Number of Localities in Michigan Represented by Replies from Correspondents for the Years 1877, 1878, 1879, 1880, 1881, 1882, and 1883:

	YEARS.						
	1877.	1878.	1879.	1880.	1881.	1882.	1883.
Number of localities represented..	23	39	23	26	31	19	25
Total estimated population.....	218,980	285,867	202,329	210,176	241,584	170,100	230,419
Estimated number of deaths.....	3,393	3,749	3,272	3,430	4,524	3,104	3,639
Average deaths per 1,000 persons..	15.50	13.10	16.17	16.32	18.74	18.25	15.79
Highest death-rate reported*.....	40.00	25.00	33.33	25.00	†29.63	18.8	33.7†
Lowest death-rate reported*.....	1.00	3.70	3.33	2.50	1.8	5.71	0.7

\* Number of deaths in each year in each thousand persons living.

† Death-rate large because of Diphtheria.      ‡ At Michigan Asylum for Insane.



EXHIBIT 2.—*Indicating by Geographical Divisions of the State and by Localities, the Diseases of Increased and of Lessened Prevalence in Michigan during the year 1883, and Supposed Causes of Increased and of Lessened Prevalence,—as Compiled from the Replies by 23 Correspondents to Questions 6, 7, 8, and 9, of Circular 67 from the State Board of Health.*

Divisions* and Localities.	Diseases of Increased Prevalence.	Supposed cause of Increased Prevalence.	Diseases of Lessened Prevalence.	Supposed Cause of Lessened Prevalence.
All Localities.	See Summary of Replies to Question 6, page 66.		See Summary of Replies to Question 8, page 66.	
UPPER-PENINSULAR DIV.* Fairbanks.	Scarlet fever and typhoid fever.	Contagion and impure drinking water.	Infantile diarrhea.	Unknown.
Sherman.	Acute pulmonary consumption.		Contagious and infectious.	Better sanitary regulations.
NORTHWESTERN DIV.* Bear Lake.	Scarlet fever.		Typo-malarial pneumonia.	Unknown.
WESTERN DIVISION.* Hershey.	Influenza.	Unknown.	About all dysentery.	Unknown.
Wyoming.	Not any.			Very high water washed a great deal of decaying vegetable and animal matter from the shores and low lands along the river.
BAY AND EASTERN DIV.* Brockway.	Typhoid fever and consumption.	A cold and wet spring and summer.	Pneumonia and scarlet fever.	Unknown.
Sanilac.	Diphtheria and pneumonia.	Unknown.	Consumption.	A more healthy year, and better sanitary regulations.
Saginaw.	None.		Nearly all.	
CENTRAL DIVISION.* Hoyville.	Scarlet fever, pneumonia, inflammation of kidney.	Lack of sanitary precautions.	Diphtheria, bronchitis, inflammation of bowels.	Perhaps to improvements in drainage.
Hastings.	Not any.		Diphtheria.	Less malaria.
Vermontville.	Intermittent fever, consumption, alcoholism. Pulmonary embolism.	No satisfactory cause, except for alcoholism, which needs no statement.	Pneumonia, diphtheria.	Unknown.
SOUTHWESTERN DIV.* Niles.	Diphtheria.	No, unless diphtheria might be caused by the intolerable smell from slaughter-houses and bone and hide stores.	Malaria and typho-malarial fevers.	A cool summer.
Otsego.	None.		Diphtheria.	Unknown.
SOUTH-CENTRAL DIV.* Asylum for Insane, Kal.	Measles.	Contagion.	Pneumonia, pulmonary consumption.	Unknown.
Brooklyn.	Diseases of the kidney.	More prevalent use of ice water, beer, and Warner's Kidney cure, especially the latter.	Pneumonia and malarial difficulties.	Higher temperature and drainage.
Mendon.	None, except it be consumption.	Unknown.	Typhoid fever.	
Union City.	Compared with 1882, consumption (pulmonary), pneumonia.		Typhoid fever.	Unknown.
Xpslaunti.	Paralysis.			

## SOUTHEASTERN DIV.\*

Detroit.....	Diphtheria, scarlet fever, and cholera infantum.	Cannot, except for cholera infantum which was caused by a short warm spell in July.	Typhoid and remittent fevers.	To the usually cool summer, except in July.
Milford.....	Scarlet fever.	Contagion	Pneumonia and continued fever	Healthy climatic causes.
Northville.....	Measles.	Contagion	Diphtheria	Immunity from contagion, and enforcement of sanitary regulations.
Walled Lake.....	Pneumonia, cancer, membranous croup.		Typhoid fever.	
Wyandotte.....	Scarlet fever in Jan. and Feb., and diphtheria.			

EXHIBIT 1.—*Eleven Geographical Divisions of the State, formed for the purpose of facilitating the Study of Causes of Sickness and of Deaths; with a List of Counties included in each Division.*

1.—Upper Peninsular.	2.—North- western.	3.—Northern.	4.—North- eastern.	5.—Western.	6.—Northem- Central.	7.—Bay and Eastern.	8.—Central.	9.—South- western.	10.—Southern Central.	11.—South- eastern.
Baraga.	Benzie.	Antrim.	Alicona.	Kent.	Clare.	Arenac.	Barry.	Allegan.	Branch.	Macomb.
Chippewa.	G'd Traverse.	Charlevoix.	Alpena.	Lake.	Gladwin.	Bay.	Clinton.	Berrien.	Calhoun.	Monroe.
Delta.	Leelanaw.	Cheboygan.	Iosco.	Mason.	Isabella.	Huron.	Eaton.	Cass.	Hillsdale.	Oakland.
Houghton.	Manistee.	Crawford.	Montmorency.	Muskegon.	Mecosta.	Lapeer.	Genesee.	Van Buren.	Jackson.	Wayne.
Isle Royal.	Manitou.	Emmet.	Ogemaw.	Newaygo.	Midland.	Saginaw.	Gratiot.		Kalamazoo.	
Keweenaw.	Missaukee.	Kalkaska.	Oscoda.	Oceana.	Roscommon.	Sanilac.	Ingham.		Lenawee.	
Mackinac.	Wexford.	Otsego.	Presque Isle.	Osceola.		St. Clair.	Ionia.		St. Joseph.	
Marquette.				Ottawa.		Tuscola.	Livingston.		Washtenaw.	
Menominee.							Montcalm.			
Ontonagon.							Shiawassee.			
Schoolcraft.										

The replies by correspondents are grouped by geographical divisions of the State, shown in this exhibit, and alphabetically by localities within the divisions. This exhibit is printed here in order to aid in turning to replies from particular localities, without referring to the index, and that reference may readily be made to it by page, from the exhibits which follow. On page 113 of the Report of the State Board of Health for 1883, the divisions and the counties in each are indicated on a map of the State.

\* For counties in each division, see Exhibit 1, on this page.

[Continued from page 56.]

59 per cent; and in 1883, 46 per cent. The proportion who reported the sickness about the same as in previous years was, in 1879, 33 per cent; in 1880, 59 per cent; in 1881, 40 per cent; in 1882, 25.9 per cent; and in 1883, 38 per cent. These figures, therefore, indicate that there was a greater decrease of sickness in Michigan in 1883 than in any of the years mentioned with the exception of the year 1882.

5. Compared with previous years, and from all causes, was the ratio of *deaths* to inhabitants during the year 1883, *greater*, *less*, or about *the same as the average*? If not the same, how much was it increased or diminished?

In answer to this question seven correspondents stated that the ratio of deaths to inhabitants was the same as the average; 5 that it was greater; and 12 that it was less. In one locality the increase was more than 100 per cent; the average increase reported is 34 per cent. Three observers reported a decrease greater than 25 per cent, one of them reporting a decrease of 95 per cent; the average decrease reported is 30 per cent.

#### DISEASES MORE THAN USUALLY PREVALENT IN 1883.

6. What diseases, or causes of death, were *more* prevalent in 1883, than usual in previous years?

Twenty-three replied to this question. Four stated that there were no diseases or causes of death in 1883 more prevalent than in previous years; nineteen mentioned some diseases as being more than usually prevalent; six reported a greater prevalence of scarlet fever; five, of consumption; four, of diphtheria; four, of pneumonia; two of typhoid fever; and two of measles. Influenza, puerperal fever, paralysis, cancer, membranous croup, inflammation of kidneys, and diseases of kidney were reported, each by one correspondent. Answers to question 6 may be found conveniently arranged for study in Exhibit 2, on pages 58-59.

7. If you can assign any *cause* for the *unusual prevalence* of any disease, please do so.

Thirteen correspondents replied to this question. Their replies may be found in Exhibit 2, pages 58-59.

8. What diseases, or causes of death, were *less* prevalent in 1883, than usual in previous years?

A lessened prevalence of diseases or causes of death was reported in twenty-one localities in Michigan in 1883, in reply to question 8. Pneumonia was reported less prevalent by 6; diphtheria, by 5; typhoid fever, by 4; typho-malarial fever, by 2; malarial difficulties, by 2; consumption, by 2; "nearly all," by 2; scarlet fever, inflammation of bowels, remittent fever, continued fever, bronchitis, dysentery, "contagious and infectious diseases," and infantile diarrhea, each by one. Answers to question 8 are also tabulated in Exhibit 2, pages 58-59.

9. To what do you attribute the lessened prevalence?

Replies to question 9 are also arranged in Exhibit 2. The number who replied to this question was 19.

#### MORTALITY IN MICHIGAN IN 1883.

10. From what diseases or causes was there *more* than the usual *mortality* during the year 1883?

Twenty correspondents replied to this question. Five reported that in their locality there were no causes of more than usual mortality. The following diseases and causes were reported to have been attended by an unusually high mortality in 1883: Consumption by 6 correspondents; diphtheria, scarlet fever, and pneumonia, each by 3; puerperal fever by 2; membranous croup, accidents, Bright's disease, alcoholism, pulmonary embolism, cerebro-spinal meningitis, and typhoid fever, each by 1. A tabular view of the replies to this question is shown in Exhibit 3, page 61.



EXHIBIT 3.—*Indicating, by Localities in Michigan, the diseases from which there was Increased Mortality, the Diseases from which there was Lessened Mortality, during the year 1883, and the Supposed Causes of Increased and of Lessened Mortality,—as compiled from the Replies by 22 Correspondents to questions 10, 11, 12, and 13, in Circular 67, from the State Board of Health.*

Divisions* and Localities.	Diseases of Increased Mortality.	Supposed Causes of Increased Mortality.	Diseases of Lessened Mortality.	Supposed Causes of Lessened Mortality.
All Localities.	See Summary of Replies to Question 10.		See Summary of Replies to Question 12.	
UPPER-PENINSULAR DIV.				
Fairbanks.....	Acute Consumption.....		Typhoid fever.....	Better hygienic surroundings.
NORTHWESTERN DIV.			Contagions and infectious.....	Absence of contagious and infectious diseases.
Bear Lake.....	No one disease that caused more than one or two deaths.		Typho-malarial fever.....	
WESTERN DIV.				
Grandville.....	Consumption.....		Typho-malarial fever.....	Washing away a great deal of decaying matter, and cool nights.
Horsey.....	None.....		About all.....	Unknown.
BAY AND EASTERN DIV.				
Brookway.....	Typhoid fever and consumption		Scarlet fever and pneumonia.	No assignable cause.
Fort Sanilac.....	Diphtheria.....	No assignable cause. All sporadic cases.	Consumption and typhoid fever	Prompt attention to sanitary measures.
Saginaw.....	Puerperal fever and cerebro-spinal meningitis.	Filthy surroundings.....	Diphtheria and typhoid fever...	
CENTRAL DIV.				
Hastings.....	Don't think there was any			
Hoytville.....	Scarlet fever and pneumonia.....	Neglect of sanitary matters...		Less malaria.
Vermontville.....	Puerperal fever, consumption, alcoholism, pulmonary embolism.	None, unless unusual climatic conditions.	Malarial fever, scarlet fever, diphtheria, pneumonia.	Improvement in drainage.
SOUTHWESTERN DIV.				
Niles.....	Diphtheria.....	See ans. to question 7.....	Malarial diseases.....	Fewer cases.
Oakago.....			Diphtheria.....	Absence of contagious diseases.
SOUTHEASTERN-CENTRAL DIV.				
Brooklyn.....	Bright's disease.			
Mendon.....	Accidents and consumption.....		Malarial.....	Increased knowledge and growing interest in sanitary measures, removal and disinfection of sources of contagion.
Union City.....	Pneumonia and consumption.....			Fewer cases.
Ypsilanti.....	Old age.....		Typhoid fever.	
SOUTHEASTERN DIV.			Typhoid fever.....	Fewer cases.
Detroit.....	Diphtheria and scarlet fever.....	Unknown.....		
Millford.....	None.....		Typhoid fever and remittent fever.	Fewer cases.
Northville.....	None.....			
Walled Lake.....	Membranous croup and pneumonia.			Mild type of disease.
Wyandotte.....	Scarlet fever in Jan. and Feb.		Acute diseases of all kinds.....	Milder cases and better sanitary regulations.
			Typhoid fever.	

11. If you can assign any cause for the unusual mortality from any disease, please do so.

A tabular statement of the 6 replies received to this question is shown in Exhibit 3, page 61.

12. From what disease or causes was there *less* than the usual mortality?

Twenty correspondents replied to this question. One stated that there was a lessened prevalence of all diseases; and another of acute diseases of all kinds. The following diseases were reported as of a less mortality in 1883: Typhoid fever, by 7 correspondents; diphtheria, by 4; malarial diseases by 3; pneumonia by 3; typho-malarial fever by 2; scarlet fever, "contagious and infectious diseases," consumption, remittent fever, bronchitis, and inflammation of the bowels, each by one. An abstract from the replies to this question is shown in Exhibit 3, page 61.

13. To what do you attribute the lessened mortality?

Replies from 15 correspondents are shown in Exhibit 3, page 61.

14. Please give names, and mention dates of the occurrence in 1883, of any and all diseases attended with an *unusually high rate of mortality*.

Nine correspondents replied that there were no diseases attended with an unusually high rate of mortality. Two reported consumption and one pneumonia, but did not specify time of year. One reported an unusually high rate of mortality from consumption in January, February, and April; one, of diphtheria in July and August; one, of diphtheria from July to December; one, of pneumonia from August to November; one, of scarlet fever from October to December; and one, of cholera infantum in July.

15. Please give names, and mention dates of the occurrence in 1883, of any and all diseases attended with an *unusually low rate of mortality*.

Four correspondents replied that there was no disease, or that they knew of no disease, attended with an unusually low rate of mortality. The following diseases were reported as having had an unusually low rate: Scarlet fever, by three correspondents; in Feb., Sept., and Oct. by one, in Jan. and Feb. by one, at time not stated by one; measles in Jan., Feb., March, and April by one, in Feb. March, and April by one, in Sept., Oct., Nov., and Dec. by one; typhoid fever at time not stated by two; pneumonia, malarial, and typho-malarial fevers, at time not stated, each by one; bronchitis from Jan to March by one; inflammation of bowels from July to Oct. by one.

16. Please give names, and mention dates of the occurrence in 1883, of any and all *diseases now usually occurring in your locality?*

Sixteen observers replied to this question; 5 stated that no unusual disease occurred in their locality; 4 reported diphtheria, one in July, Sept., Oct., and Dec., one in April, one in Oct., and one at time not stated; one reported measles in Jan., Feb., March, and April; one reported influenza from June to Dec.; one, senile gangrene in Dec., pulmonary embolism in May and Nov., and alcoholism in April and Dec.; one reported Bright's disease and inflammation of brain in April; one, remittent fever in Sept.; one, phagedenic ulceration of the throat.

17. State number of cases of each of the following diseases, and of any other epidemic, endemic, contagious, or infectious disease that appeared during 1883, using zeros where the disease named was entirely absent. (Facts are especially desired, but opinions are better than no statements, though it will be well to state that they are opinions.) Small-pox, cholera, scarlet fever, typhoid fever, measles, whooping-cough, cerebro-spinal meningitis, diphtheria.

Twenty-three correspondents replied to this question. Their replies are summarized as follows:—

*Small-pox.*—No observer reported this disease present; 21 stated that there was no case.

*Cholera.*—No correspondent reported cholera present; 21 stated that there was no case.

*Scarlet Fever.*—Twelve observers reported, in all 201 cases of scarlet fever; one observer reported 50 cases, one, 2 cases, and one, 1 case; eleven stated that there was no case. (On pages 99-101 of the Report of the State Board of Health for 1883 is a summary relative to the proportion of cases and deaths from scarlet fever in the year ending Sept. 30, 1883, as indicated by special reports by health officers and others.)

*Typhoid fever.*—Twelve observers reported a total of 144 cases of typhoid fever. The largest number of cases reported by one observer was 100. Ten correspondents reported that there was no case. (On page 109 of the Report for 1883, is a summary relative to proportion of cases and deaths from typhoid fever in the year ending Sept. 30, 1883, as indicated by special reports by health officers and others.)

*Measles.*—Four hundred and ninety cases of measles were reported by twelve observers. One observer reported 224 cases; one 100 cases; one but one case; two but two cases; ten reported that there was no case.

*Whooping-cough.*—Eight observers reported a total of 181 cases, the greatest number reported by one observer being 60, the least, two; 12 reported that there was no case.

*Cerebro-spinal Meningitis.*—Five observers reported fifteen cases, ranging from one to eight cases; 15 reported that there was no case.

*Diphtheria.*—14 observers reported 116 cases, ranging from one to 25 cases; 8 reported that there was no case; one that there were but few if any cases. (On pages 84-85 of the Report for 1883, is a summary relative to proportion of cases and deaths from diphtheria in the year ending Sept. 30, 1883, as indicated by special reports by health officers and others.)

18. If you know of any serious case of illness caused by vaccination, please state the details of it, mentioning the place where the virus was procured.

Fifteen correspondents stated that they knew of no such cases of serious illness; one, that he could not obtain any virus at all that would work; ten did not reply.

#### SPREAD OF COMMUNICABLE DISEASES BY SCHOOLS.

19. Has attendance on the public schools in your neighborhood in 1883 spread any of the diseases mentioned in question 17? If so, what diseases?

Twenty-one observers replied to this question. Thirteen stated that contagious diseases had not been thus spread. Seven reported scarlet fever, one of them, both scarlet fever and measles; one, scarlet fever and diphtheria; one scarlet fever, diphtheria, measles, and whooping-cough; one, measles, and one, both measles and whooping cough,—as spread by attendance on the schools.

20. Have you noticed any connection between the closing of schools and a decrease of communicable diseases in your vicinity? If so, what connection?

Eighteen correspondents replied to this question; 11 stated that they knew of no relation between the closing of school and the spread of communicable diseases: One said yes, but gave no particulars. One said "When the schools closed the diseases, scarlet fever and measles, decreased 5 per cent;" one said, "none in 1883, but in 1881 had diphtheria-maligna; schools closed and a very few cases followed. It was believed that a great danger



was averted;" one, "yes," referring to Report of State Board of Health, 1879, p. 111; another said, "The school mentioned in answer 19, some three miles from Mendon, was closed, and none in the neighborhood *who were not at the school at the time of the outbreak* of scarlet fever came down with it." One said, "There were no new cases of scarlet fever after school closed." One said, "Yes, less of scarlet fever and diphtheria." One said, "They seem to have been well impregnated [with scarlet fever] before the schools closed."

#### DISEASES AMONG ANIMALS IN 1883.

21. During the year 1883, *what diseases occurred, at what time, and to what extent among animals?*

The term epizooty has been much used in this State relative to diseases among animals; as it does not designate a definite or distinct disease, please describe the character of any disease which may have occurred. Replies concerning the prevalence, character, and communicability of "hog cholera" are especially desired.

Eighteen correspondents replied to question 21. Ten said there was no disease, or that they knew of no disease among animals; one, that there was no hog cholera; one said pink-eye in horses in Jan. and Feb.; one said "some cases of conjunctivitis during March and April among horses." One reported several cases of cerebro-spinal meningitis among horses; one, distemper among horses; one, that distemper was very prevalent among dogs in July and Aug., and many valuable ones died.

22. Within your observation did the "hog cholera" or a similar disease occur among other animals, as mice, rats, cats, dogs, hens, colts, etc., and man?

Ten correspondents replied "no" to this question; one said "no disease of note;" one, "have seen disease resembling pink-eye in man;" one said, "a large number of cats died during Aug. with abdominal difficulty;" one, that there were no diseases except among chickens.

23. If you know of any injurious effect caused by eating the flesh, lard, or other products of hogs diseased with "hog cholera," please state the facts.

Fourteen correspondents replied that there was no case of such injury, or that they knew of none.

24. If you know of any case of communication of hog cholera to man, by inoculation, or otherwise, please state the facts.

Fourteen reported that no cases were known.

#### DISEASES IN FRUITS, CEREALS, GRASSES, POTATOES, AND OTHER CROPS.

25. During the year 1883, what diseases, as rot, rust, smut, bunt, mildew, or mould, occurred among the crops, as potatoes, hops, fruits, and especially cereals and grasses?

Seventeen correspondents replied to this question. Nine reported that there was no such disease, or that they knew of none. One said "grass and potatoes were a good crop;" one said, "frost killed entire crops nearly by the first of Sept.;" one said, "corn was smutted pretty bad—but very little got up in this vicinity; hay was got in in rather bad condition from being wet." Another, "Hay and wheat suffered from getting wet." One said, "A large crop of hay." One said, "Some smutty wheat and corn, very little raised about here fit for use." Another reported, "Rust, smut, mildew;" and one, "Rust in wheat, smut in corn." One said, "Rot in potatoes."

26. As regards rye, oats, corn, buckwheat, and other grains raised in 1883, wheat in particular, what was the actual condition when ready for market or use?

Twenty correspondents replied to this question. One said, "nearly all sold for No. 1." One "Could not state, as very little grain is raised." One,

"Rye and oats were all right, corn was frost-killed as well as buckwheat." One said, "No buckwheat in the market, the most of wheat sprouted a little, and some of it very bad." One, "Wheat was shrunk." One said, "Bad." One, "Shrunk and dry, corn a failure on account of wet ground and late planting." One, "No corn raised to get ripe, on account of wet, drouth, and cold weather; no buckwheat, no rye; oats good; wheat middling quality." One said, "About the average." One, "Corn bad, other cereals fair and often good." One, "Good, except corn; wheat was soft; rye and buckwheat almost nil." One, "Good condition." One, "Not as good as usual; some of it grown; some smutty or rusty." One, "All bad, corn and wheat especially so." One, "Good, except corn, which was struck by the frost, and most all of it is soft." One, "Wheat damp." One, "Rye, wheat, and oats were fine, both as to quantity and condition; corn was very inferior though promising well." One said, "Oats a very large yield and of superior quality. Wheat half crop, and inferior quality, but in fair condition. Buckwheat all destroyed by frost." One, "Good or fairly so." One, "Unknown."

27. Were any of these grains mentioned in question 26, affected by any kind of fungus?

Nineteen replied to this question; 12 said "No;" one said, "Corn." One, "Corn, wheat, and rye;" one, "Wheat rusted and corn smutted;" one said, "No more that common;" another, "None except mold in some cases from rust;" two could not say.

28. Was the wheat raised in 1883, generally allowed to get thoroughly dry before it was threshed?

Nineteen correspondents replied to question 28, 14 saying "Yes;" three "No;" one, "Not very;" and one, "In fair condition."

29. Did a greater, a less, or the usual proportion of wheat raised in 1883, "bank" in the bin?

Eighteen correspondents replied to this question, 3 saying "greater;" 6, "usual;" one, "none;" 4, "less;" 2, "none;" one, "no;" and two that they did not know.

30. Was the hay crop secured in 1883, more or less than usually affected by mildew or mold?

Nineteen correspondents replied definitely to this question; 8 said, "more;" one, "yes, by mold;" five, "less;" one, "usual proportion;" one, "no more;" one, "good condition;" and one, "some spoiled, but no mildew."

#### SOIL MOISTURE IN 1883.

31. Please state the facts concerning the soil moisture in your locality, during each of the months in the year 1883, without reference to previous years, but comparing the months in 1883 with each other. Group them in order—driest first.

32. Compared with previous years in what months of the year 1883 was the soil in your locality unusually dry?

33. Compared with previous years in what months of the year 1883 was the soil in your locality unusually moist?

An abstract from the replies and a summary to these questions is in Exhibit 4, page 66.

#### GROUND WATER IN 1883.

34. Please state the average depth of water in wells in your locality, in each month of the year 1883.

35. In your locality what is the usual average depth of earth above the ground water, as indicated by distance from the general surface of the ground down to water in wells, streams, etc.? If different parts of your locality vary greatly, please answer for such different parts.

36. Without reference to previous years, please state the facts concerning the depth of earth above the ground water nearest the surface, in your locality, during each month of the year 1883, as indicated by the distance down to water in wells, streams, etc., or by other facts. How many feet and inches do you estimate it, in each month?

37. Compared with previous years, in what months of the year 1883 was the *ground water* in your locality *unusually high*?
38. Compared with previous years, in what months of the year 1883 was the *ground water* in your locality *unusually low*?

An abstract from these replies and a summary are shown in Exhibit 5, pages 68-9.

In view of the extremely great importance of securing the information asked for in the last five foregoing questions, it is hoped that for the year 1885 every correspondent of this Board will make a record for every month in the year, and thus be fully prepared to reply to the questions. From what has been contributed by regular correspondents and by the meteorological observers for the State Board of Health, the secretary has been enabled to prepare a paper on "The Relations of Depth of Water in Wells to the Causation of Typhoid Fever;" but he hopes to add much more to the evidence on that subject; and many similar studies await the collection of such evidence.

EXHIBIT 4—*Soil Moisture in Michigan by Months during the year 1883, as Indicated by the Replies of 18 Correspondents to questions 31, 32, and 33, of Circular 67, from the State Board of Health.*

Divisions* and Localities.	Soil Moisture by Months and without Reference to Previous Years. Months in Order of Dryness. Driest First.—(Question 31, page 65.)	Soil Unusually Dry. Time.—(Question 32, page 65.)	Soil Unusually Moist. Time.—(Question 33, page 65.)
All Localities.	†	‡	§
UPPER-PENINSULAR DIV.*			
Fairbanks .....		No.....	No.
Sherman .....			Year was unusually wet and cold.
WESTERN DIVISION.*			
Grandville.....	Apr., Aug., Sept., Oct., Dec., Nov., June, July.	April.....	All months except April.
Hersey.....	Aug., Sept., July, Oct., Apr., March, Feb., Nov., Dec., Jan., May, June.	Mar., Aug., Sept.	June and May.
BAY-AND-EASTERN DIV.*			
Brockway Center.....	Sept., Dec., Aug., Oct., Nov., July, June, Apr., May.	Sept.....	May, June, and April.
Sanilac.....		Aug., Sept., Oct.....	April, May, and June.
Saginaw .....		July, Aug., Sept.	April, May, June.
CENTRAL DIVISION.*			
Hastings.....			April, May, June.
Hoytville.....		July and fore part of Aug.	Latter part of Aug. and Sept.
Vermontville .....		Aug., Sept., and Oct.	May, June, July.
SOUTHWESTERN DIV.*			
Niles.....		Aug. and Sept.....	April, May, June and July.
Otsego.....	Jan., Feb., March.....	None.....	All, save Jan., Feb., and Mar.
SOUTHERN-CENTRAL DIV.*			
Brooklyn.....	Aug., Sept., Jan., Dec., Oct., Feb., May, Mar., Nov., Apr., July, June.	Aug., Sept.....	May, June, July.
Mendon.....	Jan., Apr., Aug., Sept., Oct., Nov., Dec., Feb., Mar., May, June, July.	Apr., Aug., Sept.	Feb., Mar., May, June, July.
Ypsilanti.....	Dec., Nov., Oct.....	December.....	April and May.
SOUTHEASTERN DIV.*			
Milford.....	Sept., Aug., Oct., July, Nov., Dec., June, Feb., Mar., Apr., May, June.		May, June, July.
Wyandotte.....		Not at all.....	In spring months.

\* For counties in each division see Exhibit 1, page 59.

† These statements cannot well be summarized. Most of them name months in order of dryness of soil, driest first. Nine correspondents replied to the question.

‡ Soil reported *unusually dry* at some time of the year 1883 by 11 correspondents, as follows: In March and April, by 1; in July, by 2; in Aug., by 7; in Oct., by 7; in Dec., by 1; also in no month, by 3; "unusually wet," by 1.

§ Soil reported *unusually moist* at some time of the year 1883, by 15 correspondents, as follows: In Jan., by 1; in Feb., by 2; in March, by 3; in April, by 8; in May, by 14; in June, by 13; in July, by 8; in Aug., by 3; in Sept., by 3; in Oct., Nov., and Dec., each by 2.



39. Please communicate facts bearing upon, or cases illustrating the causation or communicability of diseases.

One correspondent said, "I believe disease is caused by the presence inside the city limits of two slaughter-houses, and on the main street a hide and horn store." One said, "Measles introduced four separate times; spread by contagion; period of incubation in each instance very nearly two weeks." One said, "We had no scarlet fever until it was brought to us from Brighton in Feb. Then the first 12 or 15 cases could be traced to a recent direct exposure." Another replied, "One case of measles coming from school abroad introduced measles and from want of proper caution the whole country was infected."

40. If scarlet fever occurred in your locality in the year 1883, please state the facts concerning the means by which it was introduced and communicated.

One correspondent replied, "By contagion from a distant village." One said, "Only two cases occurred and they only in one family contracting the disease while in Albion, Michigan." Another reported as follows: "It was brought in from outside, and in a day or two a child who came from south part of State was attacked, and finally one child in another family in same house was attacked. The rest of the cases were sporadic, although when in one family they all had it; but the next case might have been 5 miles from there with no possible chance for contagion." One said, "Not known, except one, the last case, who came from Detroit, and had the disease 3 or 4 days after her arrival." One reported it introduced by a school teacher. One said, "It was introduced from two sources: 1st, By direct contagion between a boy residing here and one in the country sick of the fever; 2d, As believed, by a physician who was attending a scarlet fever patient, giving it to his own child from his infected clothing." One reported the existence of both scarlet fever and diphtheria in a servant girl who had contracted the disease at home. There was no further spread of the disease. One reported isolation of two cases, and no cases followed. One reported two cases derived from a visitor from a known source at Kalamazoo; also 8 cases in September originated from a school. One said, "Two cases imported from Battle Creek." One reported it introduced from Brighton, and conveyed to school on account of mistake in diagnosis. One said it was introduced by a man moving into the family and afterwards coming down with the disease. One said, "How introduced do not know. Spread both by schools and contiguity of residence."

41. If diphtheria occurred in your locality in the year 1883, please state the facts concerning the means by which it was introduced and communicated.

One correspondent reported the case of a woman who was exposed at Copper Falls, Minn., by attending a funeral in a house where a child was sick with diphtheria. One reported a case "sporadic, probably." Another said, "causes not known, all sporadic cases." One said, "by foul privies mostly, a few cases by sewer gas and other filth." One said, "it is indigenous." One reported that diphtheria was probably introduced by means of filth. One said that he was unable to trace any connection between any two cases. One reported two cases, but could give no source of contagion; there had been a few slight cases of sore throat. One said, "There were four cases, two in each of two families. In one family the disease had been in the house some 16 years before. In one week after tearing out the inside and repairing the house the mother and only child were taken down the same day. I am positive there could have been no other means of contagion. The others, as far

EXHIBIT 5.—*Depth of Water in Wells, Depth of Earth above Ground Water, and Relative Height of Ground Water, in Michigan, by Months, during the Year 1883,—as Indicated by the Replies of 21 Correspondents, to Questions 34, 35, 36, 37, and 38, of Circular 67, from the State Board of Health.*

Divisions* and Localities.	Average Depth of Water in Wells, by Months,—(Question 34, page 65.)	Usual Depth of Earth Above Ground Water,—(Question 35, page 65.)	Depth of Earth Above Ground Water, by Months —(Question 36, page 65.)	Ground Water Unusually High. Time.—(Question 37, page 65.)	Ground Water Unusually Low. Time.—(Question 38, page 65.)
All Localities.	†	‡	§		¶
UPPER-PENINSULAR DIV.* Sherman	Wells do not change much, perhaps 4 feet.	Five feet is an average.			
NORTHWESTERN DIV.* Bear Lake		In wells about 35 ft. In places 100 ft. In others 8, 10, and 20 ft.	About 16 ft., as water is derived from Straits of Mackinaw.		
NORTHERN DIVISION.* Mackinaw City	No variation the year round.	About 18 to 20 feet.		June and July.	
WESTERN DIVISION.* Grandville. Hersey.	Jan. 6, Feb. 6, Mar. 12, April 14, May 14, June 12, July 10, Aug. 9, Sept. 6, Oct. 6, Nov. 8, Dec. 3 feet.	Ten feet.	Jan. 12, Feb. 12, March 6, April 6, May 6, June 6, July 8, Aug. 9, Sept. 12, Oct. 12, Nov. 10, Dec. 10.	May and June.	September.
Sanilac.	Jan., 4 ft., Feb., 4 ft., Mar., 6 ft., April, 14 ft., May, 14½ ft., June, 14½ ft., July, 2½ ft., Aug., 2 ft., Sept., 2½ ft., Oct., 7 ft., Nov., 8 ft., Dec. 6 ft.	20 to 25 feet. 4 to 8 feet.	Jan. 10 ft., Feb., 10 ft., Mar. 8 ft., Apr. 2 ft., May, 1½ ft., June, 1½ ft., July, 8 ft., Aug. 9 ft., Sept. 9½ ft., Oct. 8 ft., Nov., 8 ft., Dec., 8½ ft.	April, May, and June. April, May, and June.	Jan., Feb., and March. July, Aug., and Sept.
Saginaw.					
CENTRAL DIVISION.* Hastings. Hoyville.		20 to 60 feet. 25 to 30 feet.		Sept., Oct., and Nov.	Jan. and Dec.
Vermontville.					
SOUTHWESTERN DIV.* Niles.	Lake water used.	About 10 feet; much more west and less south.		June and July. Last nine months.	September. None.
Osego.					
SOUTHERN-CENTRAL DIV.* Asylum for Insane (Kalamazoo). Brooklyn.	Does not vary. Four to eight feet each month.	About 120 feet. From 12 to 100 feet.		June and July.	January and April.
Mendon.		About 20 ft., does not vary much.		February and March.	

Union City.....	35 to 40 ft. on north side of river. 12 to 20 ft. on south side of river.	April and May.
Ypsilanti.....	West side of Huron river about 20 to 40 feet. East side 40 to 70 feet.	April and May.
SOUTHEASTERN DIV.*	From 25 to 100 feet.	
Milford.....	Wells 25 to 40 feet; springs flowing abundant, with hard ground about them.	
Northville.....	18 to 20 feet.	Spring months.
Wyandotte.....	Water, as a general rule, in wells all summer; very unusual.	

\* For counties in each division, see Exhibit 1, page 59.

† In reply to question 34, eight correspondents made statements with regard to the average depth of water in wells, by months in 1883.

‡ In reply to question 35, nineteen correspondents made statements concerning the usual average depth of earth above ground water in their localities.

§ In reply to question 36, four correspondents made statements concerning the depth of earth above ground-water, by months in 1883.

|| Ground water reported *unusually high* at some time of the year 1883, by thirteen correspondents, as follows: In Feb., by 1; in March, by 2; in April, by 6; in May, by 7; in June, by 8; in July, by 5; in Aug., by 1; in Sept., Oct., and Nov., each by 2; in Dec., by 1.

¶ Ground water reported *unusually low* at some time of the year 1883, by six correspondents, as follows: In Jan., by 3; in Feb., March, April, July, Aug., and Dec., each by 1; in Sept., by 3; also, in no month, by 1.

as I could ascertain, were generated *de novo*. Filth, poverty, destitution, and dirt were its surroundings." One said, "three cases sporadic. In one case the surroundings were bad, the well from which water was used was in a bad condition, bricked up, with curbing left behind the wall, so fungous growths were seen on the wall as far down as water edge. It was not examined with the microscope, but the taste was bad, and I think the two cases which were located in the house near the well and used the water, were caused by using the water, one case proving fatal." One said, "a few light cases only, and no clue to source of contagion." Another reported that it seemed to be sporadic. One, "spread both by schools and contiguity of residence."

42. Suggestions concerning methods which seem practicable for the prevention of sickness or deaths in your locality, or in this State, will be gladly received. (They may be written on another sheet if you do not find room here.)

Dr. F. E. Andrews, of Bear Lake, wrote as follows: "Better drainage and more care with privies, drains, and also the stopping of persons throwing dish-water, slops, etc., on the ground. Our population is mainly Norwegian, Swedish, etc., and they have no thought of afterwards, only to get rid of slops, etc., as easily as possible."

Dr. Archibald Mitchell, of Brockway Center, said, "Better drainage and better school ventilation."

Dr. N. D. Lee, of Saginaw, wrote: "In cleanliness there is godliness and health. I am satisfied that bad sewerage, foul privies or water-closets, bad ditches, foul cellars, with sewer gas, and wells fouled from privies, sewers, barns, and fifth generally are the cause of more than half of our sickness and deaths here and throughout the State."



Dr. O. S. Bailey, of Hoytville, suggested greater activity on the part of the township board of health.

Dr. Parmenter, of Vermontville, suggested compensation to health officers for making and recording observations.

Dr. Irwin Simpson, of Niles, wrote: "I would suggest that butchers be compelled to move their slaughter-houses outside the city limits and away from any dwelling house or public road, and that dealers in hides and horns be compelled to remove their stock from the most public and thickly populated parts of the city."

Dr. Palmer, of Brooklyn, said "Extensive, deep, and thorough drainage has reduced my income from five hundred to a thousand dollars a year."

Dr. R. P. Beebe, of Union City, recommended cleaning of a cesspool at a hotel.

Dr. J. M. Swift, of Northville, wrote: It is, with present indifference on the part of householders to the importance of the subject, practically impossible to awaken attention to proper methods in country communities, and small villages. Cesspools, privies, and general slovenliness about cellars and door-yards, are most fruitful sources of sickness. "Swill barrels" and sink-holes for slops, especially so. More practical attention should be awakened.

For convenience of study and reference, the replies to the circular have been grouped by geographical divisions of the State, which divisions are shown in Exhibit 1, page 5. It should be remembered that the Board assumes no responsibility for opinions or theories expressed by those who reply to its circulars, but its correspondents have been selected with great care, and include many of the leading physicians in the State.

Respectfully submitted,

HENRY B. BAKER, *Secretary.*

The replies to Circular 64 are as follows:—

#### UPPER-PENINSULAR DIVISION OF THE STATE.\*

REPLIES BY GEO. W. ORR, M. D., OF CENTRAL MINE, MICH.

- |   |  |
|---|--|
| 1. † 1,000.   | 22. No.  |
| 2. 12.  | 23. I know of none.  |
| 3. Sherman township, Keweenaw county, Mich.   | 24. I know of no case.   |
| 4. About the same.  | 25. Grass and potatoes were a good crop.   |
| 5. Less; diminished about 4 or 5 to the 1,000.  | Grain (?) is not raised in this country.   |
| 6. Acute pulmonary consumption.   | 31. Last year was an unusual wet and cold season but the soil does not hold the water, it is so hilly.   |
| 8. Contagious and infectious.   | 34. <i>December:</i> Wells do not change much; perhaps 4 feet.   |
| 9. Better sanitary regulations.   | 35. 5 feet is an average.  |
| 10. Acute consumption.  | 41. Mrs. Derrick, age 28, was exposed at Copper Falls Mine. She attended a funeral in a house where a child was sick with diphtheria. As soon as I ascertained the facts, I isolated her and imposed strict sanitary regulations, and gave her children (4 in number) sulphur; also fumigated. They all escaped. |
| 12. Contagious and infectious.  |  |
| 13. Absence of contagious and infectious diseases.  |  |
| 14. Acute consumption.  |  |
| 16. Sept. 25th, remittent fever; diphtheria Oct. 28th.  |  |
| 17. Small-pox, cholera, scarlet fever, 0; typhoid fever, 3; measles, whooping-cough, cerebro-spinal meningitis, 0; diphtheria, 1. |  |
| 19 and 20. No.  |  |
| 21. I have not had my attention called to any trouble among animals this year.  |  |

Very respectfully,

GEO. W. ORR, M. D.  
Central Mine, Keweenaw Co., Jan. 16, 1884.

\* For counties included in each division, see Exhibit 1, page 59.

† The figures beginning paragraphs refer to questions in circular 67, printed (in small type) on pages 55-70, of this Report. A summary of the Replies is printed on pages 55-70.

## REPLIES BY H. W. DAVIS, M. D., OF FAYETTE, MICHIGAN.

1. † Not incorporated. About 2,500.
2. Number of deaths, four.
3. Township of Fairbanks, county of Delta.
4. The same.
5. Less; about one-third.
6. Scarlet fever, typhoid fever.
7. (1) The intercourse with people in a distant village where scarlet fever was prevalent; (2) The unpure drinking-water.
8. Infantile diarrhea.
12. Typhoid fever.
13. Better hygienic surroundings.
14. None.
15. Scarlet fever, January and February.
17. Small-pox, cholera, 0; scarlet fever, 10; typhoid fever, 6; measles, whooping-cough, 0; cerebro-spinal meningitis, 1; diphtheria, 0.
18. None.
19. Yes; scarlet fever.
20. Yes; they seem to have been well impregnated before the schools closed.
26. Good; nearly all sold for No. 1.
27. No.
28. Yes.
29. Usual.
30. Yes.
- 32 and 33. No.
40. Have mentioned before; by contagion from a distant village.

H. W. DAVIS, M. D.  
*Fayette, Delta Co., Mich., Jan. 30, 1884.*

## NORTHWESTERN DIVISION OF THE STATE.\*

## REPLIES BY F. E. ANDREWS, M. D., OF BEAR LAKE, MICHIGAN.

1. † Not incorporated; 800 inhabitants.
3. Bear Lake village, and township of Bear Lake.
4. Very much less. Diminished one-half.
5. Less. Diminished at least one-third.
6. Scarlet fever caused one death last year, when we had none the year before.
7. I can not find any cause, unless it be the unusually cold summer, as we had no very hot weather.
8. Typho-malarial, pneumonia.
10. There was no one disease that caused any more than 1 or 2 deaths.
12. Typho-malarial.
17. Small-pox, cholera, none; scarlet fever, 15; typhoid fever, 3; measles, whooping-cough, cerebro-spinal meningitis, diphtheria, none. The scarlet fever was of a very mild form and caused but one death, and that was from carelessness.
18. No, I do not.
19. Yes. Scarlet fever of the mildest type.
20. Yes.
22. Not to my knowledge.
23. None.
24. No, I do not.
25. Frost killed entire crops nearly by the first of September.
26. Rye and oats were all right; Corn was frost-killed as well as buckwheat.
27. Not to my knowledge.
28. Yes.
29. Usual.
30. Less.
31. August was quite dry, but the whole summer there was an unusual amount of rain.
32. Unusually wet.
33. Yes.
35. In wells, about 35 feet; in places, 100 feet; in others, 8 ft., 10 ft., 20 ft.
40. It was brought in from outside, and in a day or two a child who came from south part of State was attacked, and finally one child in another family in same house was attacked. The rest of the cases were sporadic, although when in one family they all had it; but the next case might have been 5 miles from there, with no possible chance for contagion.
42. Better drainage and more care with privies, drains, and also the stopping of persons throwing dish water, slops, etc., on the ground. Our population is mainly Norwegian, Swedish, etc., and they have no thought of afterwards only to get rid of slops, etc., as easily as possible.

F. E. ANDREWS, M. D.  
*Bear Lake, Manistee County, Jan. 12, 1884.*

## NORTHERN DIVISION OF THE STATE.\*

## REPLIES BY SAMUEL J. POWER, M. D., OF MACKINAW CITY, MICHIGAN.

1. † About 500.
3. Eight miles west, sixteen miles south, and six east.
4. Greater; about 10 per cent.
5. Less; about 10 per cent.
7. Probably due to the increase in population.
13. There was no regular physician in the place prior to May, 1883.
16. Bilious dysentery, July 5.
17. Small-pox, cholera, 0; scarlet fever, 2; typhoid fever, 0; measles, 2; whooping-cough, 0; cerebro-spinal meningitis, 1; diphtheria, 0.
22. Large numbers of cats died during August with abdominal difficulty.
26. Could not state as very little grain is raised.
35. About 16 feet.
36. About 16 feet as water is derived from straits of Mackinaw.
40. Only two cases occurred and they only in one family, contracting the disease while in Albion, Mich.

SAMUEL J. POWER, M. D.  
*Mackinaw City, Cheboygan Co., Jan. 12, 1884.*

## WESTERN DIVISION OF THE STATE.\*

## REPLIES BY A. H. WESTON, M. D., OF GRANDVILLE, MICHIGAN.

1. † 2,200 in township.
2. Fifteen.
3. Township of Wyoming.
4. Less; very little.
5. About the same.
6. Not any.
8. Dysentery.
9. I think the very high water washed away a great deal of decaying vegetable and animal matter from the shores and low lands along the river.
10. I think consumption.
12. Typho-malarial fever.
13. As before stated, washing away a great deal of decaying matter, and cool nights.
14. Not any.
15. In February, March, and April we had measles here, but very few deaths, only two I think in town.
16. Nothing new.
17. Small-pox, cholera, scarlet fever, typhoid fever, 0; measles, 30; whooping-cough, cerebro-spinal meningitis, 0; diphtheria, 41; none in my practice, but heard of a few cases.

\*For counties included in each division, see Exhibit 1, page 59.

†The figures beginning paragraphs refer to questions in Circular 40, printed (in small type) on pages 55-70 of this Report. A summary of the replies is printed on pages 55-70.

19. No.
20. No.
21. Have heard of nothing.
25. Corn was snouted pretty bad; but very little got ripe in this vicinity. Hay was got in in rather bad condition from being wet.
26. No buckwheat in the market. The most of wheat sprouted a little and some of it very bad.
27. Not to my knowledge.
28. Yes.
29. More, I think.
30. More.

31. April, August, Sept., Oct., Dec., Nov., June July.

32. No month as dry as usual, except April.
33. June and July.
35. About 18 to 20 feet.
37. June and July.
40. No scarlet fever.
41. Diphtheria was in northeastern part of township, near Grand Rapids. I know nothing of the cases or history of them.

A. H. WESTON, M. D.  
*Grandville, Kent County, Jan. 16, 1884.*

#### REPLIES BY E. HALSEY WOOD, M. D., OF HERSEY, MICH.

1. † Village; population, 350.
2. None.
3. For the village of Hersey, and parts of two adjoining townships.
4. Less; diminished 75 per cent.
5. Less; diminished 95 per cent.
6. Influenza was more prevalent, causes of death did not prevail.
8. About all.
10. None.
12. About all.
- 14 and 15. None.
16. Influenza occurred from June till December.
17. Small-pox, cholera, scarlet fever, 0; typhoid fever, 1; measles, whooping-cough, cerebro-spinal meningitis, 0; diphtheria, 1.
18. None.
- 19 and 20. No.
21. None.
- 22, 23, and 24. No.
25. None.
26. Wheat was shrunk.

27. No.
28. Yes.
29. None.
30. More.
31. August, September, July, October, April, March, February, November, December, January, May, June.
32. March, August, and September.
33. June, May.
34. No variation the year round.
35. 20 feet.
39. Have observed none this year.
40. None.
41. One case—sporadic, probably.
42. Some of the cases of influenza that occurred in this village were followed by cough, night-sweats, headache, pain between shoulders, with areas of lung-dullness. \* \* \* It was not plain why this sequela of influenza should have occurred.

E. HALSEY WOOD, M. D.  
*Hersey, Osceola Co., Jan. 10, 1883.*

#### BAY AND EASTERN DIVISION OF THE STATE.\*

##### REPLIES BY ARCHIBALD MITCHELL, M. D., OF BROCKWAY CENTER, MICH.

3. † Townships of Brockway, Lynn, Maple Valley, Speaker, Fremont, and Greenwood.
4. Greater. Increased one-fifth.
5. Greater. Increased one-fourth.
6. Typhoid fever and consumption.
7. A cold and wet spring and summer.
8. Pneumonia and scarlet fever.
10. Typhoid fever and consumption.
11. [Compare answer to question 33.—H. B. B.]
12. Scarlet fever and pneumonia.
17. Cholera, scarlet fever, 0; typhoid fever, 100; measles, 224; whooping-cough, cerebro-spinal meningitis, diphtheria, 0.
- 19 and 20. No.
21. Not any.
22. No.
- 23, 24, and 25. None.
26. Bad.
27. No.

28. Yes.
29. No.
30. Less.
31. September, December, August, October, November, July, June, April, May.
32. September.
33. May, June, and April.
34. Jan., 6; Feb., 6; March, 12; April, 14; May, 14; June, 12; July, 10; Aug., 9; Sept., 6; Oct., 6; Nov., 8; Dec., 9.
35. Ten feet.
36. Jan., 12; Feb., 12; March, 6; April, 6; May, 6; June, 6; July, 8; August, 9; Sept., 12; Oct., 12; Nov., 10; Dec., 10.
37. May and June.
38. September.
42. Better drainage and better school-ventilation.

ARCHIBALD MITCHELL, M. D.  
*Brockway Center, St. Clair Co., Jan. 11, 1884.*

##### REPLIES BY N. D. LEE, M. D., SAGINAW CITY, MICHIGAN.

1. † 16,000.
2. 191.
3. City of Saginaw, Saginaw county, Mich.
4. Less. Diminished from 1881, over 50 per cent; from 1880, over 3 per cent; I have no record of 1882.
5. Less. Over 50 per cent less than 1881, over 3 per cent than 1880.
6. None.
8. Nearly all.
9. A more healthy year and better sanitary regulations.
10. None unless puerperal fever, 3 out of 5 reported; and cerebro-spinal meningitis 6 out of 8 reported.
11. The most of the cases in No. 10 had very filthy surroundings.
12. Diphtheria and typhoid fever.
13. Disease of more mild type and more promptness in attention to sanitary measures.
14. Had no unusual high rates of mortality of any disease.

15. Had an unusual low rate during the whole year.
16. Had none.
17. Small-pox, cholera, 0; scarlet fever, 11; typhoid and typho-malarial fever, 8; measles 52; whooping-cough, 9; cerebro-spinal meningitis, 8; diphtheria, 23 reported; some in each were not reported.
18. None.
- 19 and 20. No.
21. No disease of note.
22. No.
- 23 and 24. None.
25. Hay is moldy in some instances from wet weather in harvesting; wheat suffered from the same somewhat.
26. No corn raised to get ripe on account of wet, drouth, and cold weather. No buckwheat. No rye. Oats good. Wheat middling quality.
27. Not that I know of except mold in some cases from wet.
28. Not very.

\* For counties included in each division, see Exhibit 1, page 59.



29. I do not know.
30. Yes, by mold.
31. July, August, and September; very wet, April, May, and June; very cold, January, February, and March; fair average, October, November, and December, but cold.
32. July, August, and September.
33. April, May, and June.
34. Jan., 4 ft.; Feb., 4 ft.; March, 6 ft.; April, 14 ft.; May, 14 to 15 ft.; June, 14 to 15 ft.; July, 8 ft.; Aug., 2 ft.; Sept., 2 to 3 ft.; Oct., 7 ft.; Nov., 8 ft.; Dec., 6 ft. Wells are estimated at 16 feet in depth; some more, some less.
35. 4 to 8 feet, owing to locality and drainage.
36. Jan., 10 ft.; Feb., 10 ft.; March, 8 ft.; April, 2 ft.; May, 2 to 1 ft.; June, 2 to 1 ft.; July, 8 ft.; Aug., 9 ft.; Sept., 10 to 9 ft.; Oct., 8 ft.; Nov., 8 ft.; Dec., 8 to 9 ft. A 16-foot well is about 6 or 7 feet

in hardpan below where we get any water.

37. April, May, and June.
38. July, August, and September.
40. Not known except one, the last case, who came from Detroit and had the disease 3 or 4 days after her arrival.
41. By foul privies mostly; a few cases by sewer gas and other filth.
42. In cleanliness there is golliness and health; I am satisfied that bad sewerage, foul privies or water-closets, bad ditches, foul cellars with sewer gas, and foul wells from privies, sewers, barns, and filth generally are the cause of more than half of our sickness and deaths, here and throughout the State.

N. D. LEE, M. D., *Health Officer.*  
*Saginaw, Saginaw Co., Mich., Jan. 7, 1884.*

#### REPLIES BY JOSEPH M. LOOP, M. D., OF PORT SANILAC, MICH.

1. †Sanilac township.
2. Nine.
3. Township of Sanilac.
4. About the same.
5. About the same.
6. Diphtheria and pneumonia.
8. Consumption.
10. Diphtheria.
11. No assignable cause; all sporadic cases.
12. Consumption and typhoid fever.
14. Diphtheria, in July and August.
15. Typhoid fever.
16. Diphtheria.
17. Small-pox, cholera, scarlet fever, typhoid fever, measles, whooping-cough, cerebro-spinal meningitis, 0; diphtheria, 6.
18. None.
- 19 and 20. No.
21. Have not noticed any.
22. No.

23. None noticed.
24. No cases.
25. None.
26. Shrunken and dry; corn a failure on account of wet ground and late planting.
27. No.
28. Yes.
29. No bank.
30. No more.
31. Part of July, August, and Sept.; wet, April, May, and June.
32. August, September, and October.
33. April, May, and June.
35. From 20 to 25 feet.
37. April, May, and June.
38. January, February, and March.
40. No cases.
41. Causes not known—all sporadic cases.

JOSEPH M. LOOP, M. D.  
*Port Sanilac, Sanilac Co., Feb. 14, 1884.*

#### CENTRAL DIVISION OF THE STATE.\*

##### REPLIES BY A. P. DRAKE, M. D., OF HASTINGS, MICHIGAN.

1. †2,800.
2. About thirty.
3. Six miles radius.
4. Less; estimated one-third less.
5. About the average.
6. Not any.
8. Diphtheria.
9. Less malaria.
10. Don't think there was any.
12. See answers to 8 and 9.
14. There was none.
15. Don't think there was less mortality for the amount of sickness.
16. Don't know of any.
17. Small-pox, cholera, scarlet fever, 0; typhoid fever, measles, whooping-cough, cerebro-spinal meningitis, diphtheria, but few if any.

18. Don't know of any vaccinating done during the past year.
- 19 and 20. No.
21. Don't know of any.
- 22, 23, and 24. No.
25. None.
26. About the average.
27. No more than common.
28. Yes.
29. About usual.
30. More.
33. April, May, June.
35. From 20 to 60 feet, according to height of land above the streams.
40. Not any.
41. It is indigenous.

A. P. DRAKE, M. D.  
*Hastings, Barry Co., Feb. 11, 1884.*

##### REPLIES BY O. S. BAILEY, M. D., OF HOYTVILLE, MICH.

1. †200.
2. Five.
3. Principally Roxand township, although I have made observations in Danby, Oneida, and Sunfield townships.
4. About the same.
5. Same.
6. Scarlet fever, pneumonia, inflammation of kidney.
7. Negligence in regard to sanitation on the part of local board of health has doubtless increased prevalence of scarlatina.
8. Diphtheria, bronchitis, inflammation of bowels.
9. Perhaps to some improvements that have been made in drainage.
10. Scarlet fever and pneumonia.
11. Negligence in regard to sanitation.

12. Bronchitis, inflammation of bowels.
13. Improvement in drainage, perhaps.
14. Scarlet fever, Oct. to Dec., inclusive; pneumonia, Aug. to Nov.
15. Bronchitis, Jan. to March; inflammation of bowels, July to Oct.
17. Small-pox, cholera, 0; scarlet fever, 45; typhoid fever, 3; measles, 5; whooping-cough, 2; cerebro-spinal meningitis, 2; diphtheria, 6.
19. Yes; scarlet fever and measles.
20. Yes; when the schools closed the diseases of scarlet fever and measles decreased 5 per cent.
21. Pink eye in horses, January and February.
22. Have seen disease resembling pink eye, in man.
26. Corn, bad; other cereals fair and often good.
27. Corn and wheat and rye.
28. No.

\* For counties included in each division, see Exhibit 1, page 59.

† The figures beginning paragraphs refer to questions in Circular 40, printed (in small type) on pages 55-70 of this Report. A summary of the replies is printed on pages 55-70.

29. Less.  
 30. More.  
 31. January, July, August, December; other months more or less moist.  
 32. July and fore part of August.  
 33. Latter part of August and September.  
 37. September, October, and November.  
 38. January and December.  
 40. The means of introduction was undoubtedly a school teacher who came from abroad and was here but a few days when the rash occurred; soon after several of the school were down with the disease.

41. How introduced not plain, but undoubtedly by means of filth. The drainage although improved now was at that time bad, and most cases occurred where cleanliness had nothing to do with godliness.

42. Roxand could be made a model sanitary township if we had a model local board of health; but nine-tenths of the inhabitants would be surprised if they were informed there was such a board in town, so very reticent is this board.

O. S. BAILEY, M. D.

Hoytville, Eaton Co., Jan. 14, 1884.

#### REPLIES BY WM. PARMENTER, M. D., OF VERMONTVILLE, MICH.

1. † 800.  
 2. 20.  
 3. Village of Vermontville—about two square miles of surface.  
 4. Less—one-third less.  
 5. Greater—more than double.  
 6. Puerperal fever, consumption, alcoholism, pulmonary embolism.  
 7. No satisfactory cause except for alcoholism which needs no statement.  
 8. Pneumonia, diphtheria.  
 10. Same as No. 6.  
 11. I can assign none unless it be unusual climatic conditions.  
 12. Malarial fevers, scarlet fever, diphtheria, pneumonia.  
 15. Senile gangrene, died Dec. 9; pulmonary embolism, May 26 and Nov. 21; alcoholism April 1 and December 16.  
 17. Small-pox, cholera, 0; scarlet fever, 10; typhoid fever, measles, whooping-cough, 0; cerebro-spinal meningitis, 0 (?); diphtheria, 0.  
 18. None.  
 19. No.  
 20. Yes. None in 1833; but in 1881 had diphtheria maligna. Schools closed and very few cases followed. It was believed that a great danger was averted.  
 21. Don't know of any.

22, 23, and 24. No.  
 25. None that I am aware of.  
 26. Good except corn which was soft—rye and buckwheat almost nil.  
 27. No.  
 28. Yes.  
 29. Less.  
 30. More.  
 31. August to Nov., dry, drier, drier; April to Aug., wet, wet! wet! Rain ceased about July 15.  
 32. August, September, and October.  
 33. May, June, July.  
 35. About 25 to 30 feet.  
 40. It was introduced from two sources: 1st, By direct contagion between a boy residing here and one in the country sick of the fever; 2d, As believed, by a physician who was attending a patient, giving it to his own child from his infected clothing.

41. It did not.  
 42. A small but adequate fee from the State or county to compensate the health officer for making and recording observations, would seem to me the most practical method of preparation for the work of prevention of disease. The town boards are afraid to pay anything for such service or any other service from the health officer.

WM. PARMENTER, M. D.

Vermontville, Eaton county, Jan. 23, 1884.

#### SOUTHWESTERN DIVISION OF THE STATE.\*

##### REPLIES BY IRWIN SIMPSON, M. D., OF NILES, MICHIGAN.

1. † 4,000.  
 3. A circuit of seven miles around the city.  
 4. Less; one-fifth, perhaps.  
 5. Less; one-fourth less.  
 6. None except diphtheria.  
 7. No, unless diphtheria might be caused by the intolerable smells produced by slaughter-houses and bone and hide stores.  
 8. Malaria and typho-malarial fevers.  
 9. A cool summer.  
 10. Diphtheria.  
 11. I cannot unless the cause mentioned in answer to No. 7.  
 12. Malarial diseases.  
 13. Fewer cases.  
 14. From July to December there were about twelve cases of diphtheria with nine deaths.  
 15. Malarial and typho-malarial fevers.  
 16. Diphtheria in July, Sept., Oct., Dec.  
 17. Small-pox, cholera, scarlet fever, typhoid fever, measles, 0; whooping-cough, 20 (opinion); cerebro-spinal meningitis, 0; diphtheria, twelve cases.  
 18. I know of none such.  
 19 and 20. No.  
 21. Some cases of conjunctivitis during March and April among horses.  
 22. No.  
 23. I know of none.  
 24. No.  
 25. No disease in any. A very large crop of

hay.  
 26. Good condition.  
 27. No.  
 28. Yes.  
 29. Less.  
 30. More.  
 31. April, May, June, and July were very wet months and the soil was excessively wet.  
 32. August and September.  
 33. June and July.  
 34. I don't know; we use lake water here.  
 37. June and July.  
 38. September.  
 39. I have no facts, but believe disease is caused by the presence inside the city limits of two slaughter-houses and on the main street a hide and bone store.  
 40. We have had none.  
 41. We failed to trace it; the cases appeared all sporadic; we failed to trace a connection between any two of them.  
 42. I would suggest that butchers be compelled to move their slaughter-houses outside the city limits, and away from any dwelling or public road, and that dealers in hides and bones be compelled to remove their stock from the most public and most thickly populated parts of the city. To say the least they are disagreeable neighbors.

IRWIN SIMPSON, M. D.

Niles, Berrien county, Jan. 11, 1884.

\*For counties included in each division, see Exhibit 1, page 59.

REPLIES BY MILTON CHASE, M. D., OF OTSEGO, MICHIGAN.

1. † 1,200.
2. 16.
3. For 5 miles southeast.
4. Village about same. In country about, less. Out of village less by one-half.
5. Less. Diminished 20 per cent or more.

*Deaths in Otsego Village and Township.*

YEARS.	Village.	Town-ship.*	Total.
1877-----	10	9	19
1878-----	13	10	23
1879-----	15	23	38
1880-----	9	12	21
1881-----	11	10	21
1882-----	11	21	32
1883†-----	16	5	21

\* Outside of village.

† Population of village, in 1883, about 1,200; of township outside of village, about 1,400.

6. None.
7. None; we had no epidemics.
8. Diphtheria.
9. None.
11. Didn't have it.
12. Diphtheria.
13. Absence of contagious diseases.
- 14, 15, 16. None.
17. Small-pox, cholera, scarlet fever, typhoid fever, 0; measles, 30; whooping-cough, 60; cerebro-spinal meningitis, diphtheria, 0.
18. None.
19. No.
21. Several cases among horses of cerebro-spinal meningitis. No hog cholera.
- 23 and 24. None.
25. Some smutty wheat and corn; very little raised about here fit for use.
26. Not as good as usual; some of it grown, some smutty or rusty.
27. I think not.
28. No.
29. Greater.
30. More.
31. January, February, March, then wet till November.
32. None.
33. All, save first three.
35. Village, about ten feet; much more west of village; less south.
37. All, except first three.
38. None.

MILTON CHASE, M. D.

*Otsego, Allegan Co., Jan. 15, 1884.*

## SOUTHERN-CENTRAL DIVISION OF THE STATE.\*

REPLIES BY W. L. WORCESTER, M. D., OF MICHIGAN ASYLUM FOR THE INSANE, AT KALAMAZOO.

3. † Mich. Asylum for Insane. Patients average 759.05; others about 163. Number of deaths during year, 31, confined to patients with one exception.

4. Probably about the same.
5. Less; about two per cent.
6. Measles.
7. Contagion.
8. Pneumonia, pulmonary consumption.
17. Scarlet fever, 1; typhoid fever, 2; measles, 2; diphtheria, 2. No death from any of the above eight diseases. With exception of the cases of measles mentioned above and a mild epidemic of diarrhea in hot weather, there have been no prevailing diseases here and the deaths as usual were mainly from chronic diseases.
31. See meteorological report.
34. Does not vary.
35. About 120 feet.
39. Measles introduced four separate times, spread by contagion; period of incubation in

each instance very nearly two weeks. The two cases of typhoid fever both occurred in employees, one being attacked in the early part of July, the other late in September. Both were probably contracted away from the Asylum. For diphtheria see answer to question 41.

40. One case; the patient, a servant girl, contracted the disease at home. Diphtheritic complication occurred. No spread of either disease.

41. Two cases; one, a patient, attacked April 15, the other, an attendant, attacked Oct. 29; both mild. No source of contagion known for either case, and no direct contagion from a fully developed case possible in the former. There had been a few cases of slight sore throat about the building. No communication of diseases from either case. Both treated in their rooms on the wards, which were disinfected afterwards. Both were mild cases.

W. L. WORCESTER, M. D.

*Kalamazoo, Kalamazoo county, Jan. 9, 1884.*

REPLIES BY E. N. PALMER, M. D., OF BROOKLYN, MICHIGAN.

1. Village, six hundred.
2. Four.
3. Townships of Columbia, Norvell, Cambridge, Woodstock.
4. Less. Diminished 20 per cent.
5. Less. Diminished 10 to 20 per cent.
6. Diseases of the kidneys.
7. Don't know; think the more prevalent use of ice-water, beer, and "Warner's kidney-cure," especially the latter.
8. Pneumonia and malarial difficulties.
9. Higher temperature and drainage.
10. Bright's disease, in its various forms.
15. Measles, Sept., Oct., Nov., Dec.
17. Small-pox, cholera, scarlet fever, typhoid fever, 0; measles, 100 (?); whooping-cough, 50; cerebro-spinal meningitis, 0; diphtheria, 4.
18. Have not.
19. Yes; measles and whooping-cough.
20. Yes. See page 111 of Report of State Board of Health for 1879.

21. No "hog cholera" to my knowledge.
25. Rust, smut, mildew.
26. All bad, corn and wheat especially so.
28. No.
29. Greater.
30. More.
31. August, September, January, December, October, February, May, March, November, April, July, June.
32. August, September.
33. May, June, July.
34. Jan., 4 to 8 feet; Feb., March, April, May, June, July, Aug., Sept., Oct., Nov., Dec., same.
35. From 12 to 100 feet.
36. See answer 35. Not much variation.
37. June and July.
40. There were but two cases to my knowledge, and I could find nothing concerning their introduction. One case I should have considered doubtful if the tropical sequelæ had not nearly proved fatal. They were promptly isolated and

\* For counties included in each division, see Exhibit I, page 59.

† The figures beginning paragraphs refer to questions in Circular 40, printed (in small type) on pages 55-70 of this Report. A summary of the replies is printed on pages 51-73.



no other cases followed.

41. There were four cases, two in each of two families. In one family the disease had been in the house some 16 years before. In one week after tearing out the inside and repairing the house the mother and only child were taken down the same day. I am positive there could have been no other means of contagion. The others, as far as I could ascertain, were gener-

ated *de novo*. Filth, poverty, destitution, and dirt were its surroundings.

42. Extensive, deep, and thorough drainage has reduced my income from five hundred to a thousand dollars a year. In this selfish world you must not expect all doctors to be philanthropists.

E. N. PALMER, M. D.

Brooklyn, Jackson Co., Jan. 11, 1883.

#### REPLIES BY H. C. CLAPP, M. D., OF MENDON, MICHIGAN.

1. † 900.
2. 23.
3. This village and a radius of about five miles.
4. About the same.
5. Greater; increased about 10 per cent.
6. None except it be consumption.
7. Can not, unless in the case of consumption, the bacilli of tubercle are numerously escaping from Koch's cultivation pot and flooding the country.
10. Accidents and consumption.
12. Malarial.
13. Increased knowledge of those diseases, a growing interest in sanitary measures, and removal and disinfection of the sources of the contagion.
14. One case of consumption Jan. 25, Feb. 6, 18, April 4 and 15.
15. Scarlet fever, 10 cases, Feb. 6 and 14, Sept. 19, 20, and 24, Oct. 1, 3, 5, 6, and 11.
16. Above cases of scarlet fever, Bright's disease of kidney, April 25, inflammation of brain April 10, and diphtheria April 1 and 11.
17. Small-pox, cholera, 0; scarlet fever, 10; typhoid fever, measles, whooping-cough, cerebro-spinal meningitis, 0; diphtheria, 2.
18. None.
19. Yes, scarlet fever.
20. Yes, the school referred to in answer 19, some three miles from Mendon, was closed, and none in the neighborhood who were *not at the school* at the time of the outbreak of scarlet

fever came down with it.

21. None particularly.
22. No.
23. Heard of none.
24. Do not.
25. None of any account.
26. Good, except corn, which was struck by the frost and most all of it is soft.
27. No.
28. Yes.
29. Usual.
30. Good condition.
31. Jan., April, Aug., Sept., Oct., Nov., Dec., Feb., March, May, June, and July.
32. April, August, and September.
33. Feb., March, May, June, and July.
35. About 20 feet,—doesn't vary much.
37. February and March.
38. January and April.
40. Two cases occurring in one neighborhood in February were brought from Kalamazoo; a little girl taking it first from her father who was visiting his children from Kalamazoo, and her brother taking it from her. He came from a known source of it at that place. Eight cases seemed to originate from a school in September.
41. Two cases occurred in this village in one family in April, one died. The attending physician was not able to trace the source of the contagion.

HORACE C. CLAPP, M. D.

Mendon, St. Joseph county, Jan. 12, 1884.

#### REPLIES BY R. P. BEEBE, M. D., OF UNION CITY, MICHIGAN.

1. Union City, incorporated village; inhabitants 1,400.
2. 22. Taken from only undertaker in village.
3. Union City.
4. About the same as 1832.
5. More than 1832. Increase about one-fifth.
6. Compared with 1832, consumption (pulmonary), pneumonia.
8. Typhoid fever.
10. Pneumonia, consumption.
12. Typhoid fever.
14. Pneumonia, pulmonary consumption.
15. Typhoid fever.
17. Small-pox, cholera, scarlet fever, 0; typhoid fever, 1; measles, 2; whooping-cough, 25; cerebro-spinal meningitis, 0; diphtheria, 3.
18. I do not.
- 19 and 20. No.
21. Distemper among horses.
- 22, 23, 24. No.
25. Rust in wheat, smut in corn.
26. Wheat damp.
27. Wheat, rust; corn, smut.
28. In fair condition.
29. Usual proportion.

30. As usual.
35. 35 to 40 feet on north side of river; 12 to 20 feet on south side of river.
37. April and May.
40. Two cases imported from Battle Creek.
41. Three cases, sporadic. In one case the surroundings were bad, the well from which water was used was in a bad condition, bricked up, with curbing left behind the wall, so fungous growths were seen on the wall as far down as water edge. It was not examined with microscope, but the taste was bad and I think the two cases which were located in the house near the well and used the water, were caused by using the water, one case proving fatal.
42. There is one or two places in the village which ought to be cleaned. One is connected with hotel, is caused by throwing refuse and slops out back of hotel, which gives off a bad odor in warm weather, so it can be distinguished several blocks away. One case of typhoid fever was located near by, which proved fatal, I think the only fatal case in the village.

R. P. BEEBE, M. D.

Union City, Branch Co., Jan. 8, 1884.

#### REPLIES BY EDWARD BATWELL, M. D., OF YPSILANTI, MICHIGAN.

1. 6,000.
2. 75.
3. City of Ypsilanti.
4. Less; about one-eighth.
5. About the same.
6. Paralysis.
8. Typhoid fever.
10. The mortality was greatest amongst old people, many of whom died from paralysis, and many from no apparent cause.
12. Typhoid fever.
13. Don't know except we had fewer cases than usual for the doctors to treat.
15. Do not know of any. Undertakers expressed the opinion that "it was a terrible hard

year on their business," and doctors concurred.

16. Phagedenic ulceration of the throat.
17. Small-pox, cholera, none; scarlet fever, 5; typhoid fever, 6; measles, none; whooping-cough, 3; cerebro-spinal meningitis, 3; diphtheria, 22.
18. Know of none. The trouble being we could not obtain any that would work at all.
- 19 and 20. No.
21. Distemper was very prevalent amongst dogs in July and August; many valuable ones died.
23. No hog cholera occurred here.
24. No.
26. Rye, wheat, and oats were fine, both as to

quality and condition; corn was very inferior, though promising well.

27. Corn was.
28. It was.
- 29 and 30. Less.
31. December, November, and October were decidedly the driest as regards soil moisture.
32. December.
33. April and May.
35. West side of Huron river about 20 to 40 feet; east, 40 to 70.
37. April and May.
38. December.
40. Do not know. Five cases got here, but do not know how.

41. Diphtheria was reported in many cases where it did not exist at all; but the two fatal cases that occurred were membranous croup, a disease I deem essentially different from diphtheria, despite the opinions expressed by that august body, "the authors."

42. I would suggest that every one come to the Ypsilanti Mineral Springs that need unadulterated health. "Few die, none resign" their tenacity of life in this locality. The only question of vital importance now agitating our community is "what are we to do with the old folks."

EDWARD BATWELL, M. D.

*Ypsilanti, Washtenaw Co., Jan. 23, 1884.*

#### SOUTHEASTERN DIVISION OF STATE.\*

REPLIES BY JUDSON BRADLEY, M. D., OF DETROIT, MICHIGAN.

1. † Detroit and suburbs, 180,000.
2. 3,100.
3. Detroit and the suburbs of Springwells, Hamtramck, and Greenfield.
4. About the average.
5. About the average.
6. Diphtheria, scarlet fever, and cholera infantum.
7. Can't do it, except for cholera infantum, which was caused by a short warm spell in July.
8. Typhoid and remittent fevers.
9. To the unusual cool summer, except as above.
10. Diphtheria and scarlet fever.
12. Typhoid fever and remittent fever.

13. To the fact that there were less cases of each disease.

14. For a short time in July, cholera infantum.

18. Do not know of any.

19. It is not certain that any of the above diseases was spread by attending school, but it is probable that they were in scarlet fever, measles, whooping-cough, and diphtheria.

20. Have not.

41 and 42. The more one observes in regard to these diseases the more he is in doubt as to the modes of introduction and communication. I heartily wish we could tell something about them, but they are a puzzle to me. ‡

JUDSON BRADLEY, M. D.

*Detroit, Wayne Co., Jan. 28, 1884.*

REPLIES BY ROBERT JOHNSTON, M. D., OF MILFORD, MICHIGAN.

1. 1,600, village; 1,700 in township.
2. 12 in village, and 10 in township.
3. Township and village of Milford; I estimate population of village at 1,600, of township at 1,700.
4. Less; decreased by about 20 per cent.
5. Less; decreased by about 15 per cent.
6. Scarlet fever.
7. An epidemic of scarlet fever was started here by a man visiting here who was convalescent, having had scarlet fever.
8. Less cases of pneumonia and continued fever.
9. Healthy climatic causes.
10. None.
12. Pneumonia.
13. Mild type of diseases in general; scarlet fever was generally mild, but several cases were quite severe.
14. None.
15. Scarlet fever and pneumonia.
16. Scarlet fever.
17. Small-pox, cholera, 0; scarlet fever, 39; typhoid fever, 4; measles, 15; whooping-cough, cerebro-spinal meningitis, diphtheria, 0.
18. None.
19. Yes, scarlet fever.
20. Yes; there were no new cases of scarlet fever after school closed.
21. Do not know of any.
22. No cases that I know of except among chickens.
23. Know of none.
24. None.

25. Nothing of the kind.

26. Oats a very large yield and of superior quality; wheat half crop and inferior quality, but in fair condition; buckwheat all destroyed by frost.

27. No.

28. Yes.

29. Usual proportion.

30. Less.

31. September, August, October, July, November, December, January, February, March, April, May, June.

32. September, August, and October, about as usual; May, June, July to 20th very wet.

33. May, June, July.

35. From 25 to 100 feet.

39. We had no scarlet fever until it was brought to us from Brighton in February; then the first 12 or 15 cases could be traced to a recent direct exposure.

40. Brought by a man (while recovering from scarlet fever) from Brighton, Mich., conveyed to school by janitor and pupil, then scattered by school. I had one department closed, and all cases isolated as soon as found. Unfortunately my predecessor, the then health officer, differed with me in diagnosis, and assisted materially in spreading the disease at the start of the epidemic, by authorizing the family where it first started to attend church and school, assuring people that there was no scarlet fever in town.

41. No cases.

ROBERT JOHNSTON, M. D., *Health Officer.*  
*Milford, Oakland Co., Mich., Jan. 12, 1884.*

\* For counties included in each division, see Exhibit I, page 59.

† The figures beginning paragraphs refer to questions in Circular 67, printed (in small type) on pages 55-70 of this Report. A summary of the replies is printed on pages 55-70.

‡ The modes of introduction and spread of communicable diseases in cities "are a puzzle" to physicians generally, throughout the world. The ways in which several of those diseases may be communicated are so numerous and intricate that little short of infinite knowledge is required to unravel their mysteries, if efforts are confined to cities and thickly-settled communities where intercommunication of people is free, rapid, and complicated. But the study frequently becomes easy in sparsely-settled country districts where the movements of individuals are much more easily traced. By means of these Circulars of inquiry, many facts have already been collected by the State Board of Health which go far to illustrate and establish our knowledge of some of the various modes of spread of diphtheria and scarlet fever. H. B. B., Sec. S. B. of Health.]

## REPLIES BY J. M. SWIFT, M. D., OF NORTHVILLE, MICH.

1. † Village of Northville, 1,200.
2. There were, from all causes, only 7 deaths.
3. Sec. 3. Township of Plymouth, Wayne Co., constitutes the village of Northville, for which replies are herein made, but the general statements apply equally well to adjoining territory. Estimated population 3,500.
4. An epidemic of measles; probably 200 cases of measles in the vicinity; otherwise the same.
5. Less. Average of deaths for three previous years 12.75; for 1883, 7 deaths occurred.
6. Measles.
7. A student at the Normal School at Ypsilanti, came home here sick with measles, and a general epidemic was the result. Only 2 or 3 deaths in vicinity, only one in the village.
8. Diphtheria.
9. Immunity from contagion, and more severity in enforcing sanitary regulations, together with co-operation of the people; no mortality from ordinary zymotic diseases.
10. None; consumption, and nervous diseases, and old age, the cause of most deaths in this village and vicinity.
12. Acute diseases of all kinds; not a death from fevers; only one from pneumonia, and none from other forms of zymotic diseases.
13. Less violence of the cases and correct sanitary and hygienic regulations.
14. None.
15. Measles during January, February, March, and April.
16. Answered in "15."
17. Small-pox, cholera, scarlet fever, typhoid fever, 0; measles, 1, whooping-cough, cerebro-spinal meningitis, diphtheria, 0.
19. Measles somewhat.
21. Don't know of any.
22. Think not.
23. 25. Know of none.
26. Good or fairly so.
27. No.
28. Yes.
29. Have no knowledge.
30. Some spoiled, but no mildew in barn I believe.
35. In wells 25 to 40 feet springs flowing, pure, cold, and abundant, with hard ground about them.
37. This section is very rolling and high,—no surface water worthy of consideration. The months of June and July very wet.
38. None.
39. There is nothing especial only that one case of measles coming from school abroad introduced measles, and from want of proper caution the whole country was infected.
40. A few light cases only, and no clew to source of contagion.
41. The same may be said in answer to this as in answer to "40."
42. It is, with present indifference on the part of householders to the importance of the subject, practically impossible to awaken attention to proper methods in country communities and small villages. Cesspools, privies, and general slovenliness about cellars and dooryards are most fruitful sources of sickness. "Swill-barels" and sink-holes for slops, especially so. More practical attention should be awakened.

J. M. SWIFT, M. D.

Northville, Wayne Co., Feb. 5, 1884.

## REPLIES BY E. A. CHAPMAN, M. D., OF WALLED LAKE.

1. † Non-incorporated village, contains 150 inhabitants.
2. Four.
3. Townships of Commerce, Novi, Bloomfield, and Lyons.
4. Rather more; perhaps increased one-fourth.
5. Greater; increased about one-sixth.
6. Pneumonia, cancer, and membranous croup.
10. Membranous croup and pneumonia.
17. Small-pox, cholera, 0; scarlet fever, 10; typhoid fever, 5; measles, 8; whooping cough, 12; cerebro-spinal meningitis, 0; diphtheria, 5.
40. It was introduced by a man moving into the family and afterwards coming down with the disease.
41. Far as could be ascertained, it seemed to be sporadic.

E. A. CHAPMAN, M. D.

Walled Lake, Oakland Co., Jan. 11, 1883.

## REPLIES BY E. P. CHRISTIAN, M. D., OF WYANDOTTE, MICHIGAN.

1. † 3,600.
2. Estimated by undertaker about 50.
3. City of Wyandotte.
4. About average.
5. About an average.
6. Scarlet fever in January and February; also diphtheria.
8. Typhoid fever.
9. [See answer to question 34.—H. B. B.]
10. Scarlet fever in January and February.
12. Typhoid fever.
14. None.
- 15 and 16. Know of none.
17. Small-pox, cholera, 0; scarlet fever, 50; typhoid fever, 10; measles, 0; whooping-cough, 2; cerebro-spinal meningitis, 0; diphtheria, 25.
19. Yes. Scarlet fever and diphtheria.
20. Yes; less of scarlet fever and diphtheria.
- 21 and 22. Unknown.
25. Rot in potatoes.
26. Unknown.
28. Believe it was.
30. Believe less.
31. Very wet during spring months.
32. Not at all.
33. In spring months.
34. Water as general rule in wells all summer; very unusual.
35. 18 inches to 10 feet.
37. Spring months.
40. Prevailed very generally here Nov. 1883, to March, 1884. How introduced do not know. Spread both by schools and contiguity of residences.
41. Same as above.

E. P. CHRISTIAN, M. D.

Wyandotte, Wayne Co., Jan. 14, 1884.



## PURIFICATION OF WATER BY FREEZING.

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BY C. P. PENGRA, M. D., ASSISTANT IN THE CHEMICAL LABORATORY,  
UNIVERSITY OF MICHIGAN.

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As a supplement to former experiments upon this subject (see pages 48-50 of the Report of Michigan State Board of Health, 1882), I have made recent observations, which confirm the conclusions then drawn, that freezing does not purify water to the extent generally supposed. I then found that the purification by freezing was about fifty per cent for crystalloids and only about twenty per cent for colloids.

As the results presented in my former paper were not concerned with the living organisms so frequent in polluted water, the following experiments were deemed necessary. The micro-organisms used were such as may be obtained from decomposing meat juices, infusion of hay, and stagnant pools. Each specimen of the fluid was divided into two equal portions, one to be frozen, and the other to be reserved for comparison. The freezing was effected by exposing the fluid to the winter's cold. In each experiment ten drops of each portion were examined and the averages taken.

The first experiment was with *bacteria*. The average number per drop found in each portion was:—

In the melted ice of the upper half of the exposed fluid, 16.

In the lower half, partially frozen, 250.

In the upper half of the unfrozen portion, 160.

In the lower half of same, 170.

In all cases the number of organisms in each of ten drops was counted and an average taken. This experiment shows a purification of about 90 per cent. The averages in different portions of the unfrozen fluid show that the organisms were quite evenly distributed therein, which was also true of the following.

The second experiment was with the *coleps hirtus* of stagnant pools. The averages being taken as before, the following results were obtained:

Upper third of ice contained 25 per drop of water;

Middle third contained 190 per drop;

Lower third contained 500 per drop.

In the unfrozen fluid the average of fifteen drops was 300.

This shows a purification of 91.6 per cent in the upper third of the ice, with a gradual decrease downward. In this case the fluid was frozen through and through solid.

In a third test with *paramaecium aurelia* from a muddy pool the following results were secured:

The water from the ice contained 30 per drop;

The water under the ice contained 590 per drop;

The unfrozen fluid reserved averaged 450 per drop.

This showed a casting out of 93.3 per cent.

The fourth test was with *glaucoma scintillans* from infusion of hay; the following figures were obtained:

Water from upper half of ice contained 10 per drop;

Water from lower half of ice contained 120 per drop;

Unfrozen liquid averaged 91 per drop.

A purification of 89 per cent is secured in this case.

These figures seem, at first, quite encouraging, especially when compared with the results given in my former paper with chemical impurities. However, when we remember that freezing does not kill these organisms, and that they multiply rapidly, there is not so much consolation, as such ice may prove a fertile source of infection. The entire series of experiments shows that pure ice can come only from pure water, and that great care should be exercised in gathering this useful commodity.

Admitting the above, the question as to the best time of gathering ice arises. In answering this, the following analyses may be of value, not only as showing how impure ice may become; but the circumstances attending its formation, together with its natural surroundings, have a direct bearing on hygiene. The ice, which was about 18 inches thick, was cut and examined in such a way that we may speak of its upper and lower halves. One liter of water from the upper half gave the following results:

Total solids, 0.5 grams;

Free ammonia, 1.333 milligrams;

Albuminoid ammonia, 0.8 milligrams;

Nitrates, abundant.

Analysis of one liter of water from the lower half of the ice showed the following:

Total solids, 0.1 grams;

Free ammonia, 0.12 milligrams;

Albuminoid ammonia, 0.16 milligrams;

Nitrates, test.

Taken alone this analysis seems to disprove the fact that there is a gradual purification in freezing, downward; but a brief consideration of the circumstances will solve the mystery. The stagnant pool (for such it was from which this ice was taken) is surrounded by steep hills, which begin at the very water's edge. At the summit of the hill on one side, stand four houses, each with barn and privy. On the opposite side of the pond the hill-side is covered by an old cemetery and has a considerable growth of trees. The lower half of the ice was frozen early in the winter, and the water frozen at that time underwent the partial purification shown to take place in our experiments. Subsequently there was a fall of snow, followed by a thaw and rain. The decomposing matter from the hill-sides was washed down upon the first layer of ice, and, it becoming colder again, there froze, a distinct color in the ice marking the depth of this increase. Whatever purification might have taken place was limited by the surface of the lower half of the ice, as a result of which we have no purification in the upper half. We can easily see that in this way many additional layers of impure ice may be added.

From the foregoing we must conclude that the pollution of ice often accompanying partial thaws and subsequent freezings should be considered in harvesting, and that the first ice of winter is the purest. It is needless to suggest that skaters carry large amounts of impurities on the ice, and that fields selected for harvest should be protected from them. Even a heavy fall of snow upon ice may contaminate it to a considerable extent. An analysis of

snow falling upon a pond near the laboratory, collected during the storm, showed the following:

Total solids per litre of water from the snow, 0.12 grams;

Free ammonia per litre of water from the snow, 0.4 milligrams;

Albuminoid ammonia per litre of water from the snow, 0.21 milligrams.

The excess of free and combined ammonia may be in a measure accounted for by the nearness to the chemical laboratory of the University of Michigan.

The purest snow, gathered away from cities, contains on an average:

Free ammonia, 0.3 milligrams per litre;

Albuminoid ammonia, 0.08 milligrams per litre.

Since writing the above I have been favored with an opportunity of testing still further the validity of the ground taken. A specimen of ice, which had been garnered before any rain or thaw had come upon it, showed on analysis the following results, per litre:

Total solids, 0.08 grams;

Free ammonia, 0.19 milligrams;

Albuminoid ammonia, 0.09 milligrams;

Nitrates, none.

I afterwards gathered some ice from the same source, but there had been some rain, snow, and drainage from thawing, upon it. Skaters also had been upon the ice. Analysis showed the following results, per litre:

Total solids, 0.6 grams;

Free ammonia, 0.28 milligrams;

Albuminoid ammonia, 0.6 milligrams;

Nitrates, very abundant.

The deductions from these analyses serve to confirm my former convictions, and sustain the conclusions already given.

C. P. PENGRA.

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## THE INFLUENCE OF SAWDUST ON POTABLE AND CULINARY WATER IN MICHIGAN.

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BY R. C. KEDZIE, M. D., EX-PRESIDENT OF THE MICHIGAN STATE BOARD OF HEALTH, EX-PRESIDENT OF THE AMERICAN PUBLIC HEALTH ASSOCIATION, ETC., ETC.

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“A cup of cold water” has been for ages the cheap but significant pledge of social fellowship. It touches a want pervasive and persistent as life, more exacting than hunger, and only outranked by breath. Air, water, and bread are the tripod of life.

While potable water is most intimately related to public health, there are few conditions for living less within the control of the individual. If his butcher or grocer offer him inferior articles he may buy elsewhere and select his own conditions of living. But soil-water comes from a common stock, is communal rather than individual in character, and it is the prudence or



thoughtlessness of the neighborhood which maintains purity or causes defilement. The soil-water (with certain modifications arising from the oxidizing and absorptive influence of soils) will represent the average cleanliness or filthiness of the neighborhood. All substances added to the soil which are soluble in water or capable of solution by decomposition, will find their way into the soil-water of the vicinity unless fixed by chemical combination by the ingredients of the soil. With this modification the well is the slop-bowl of the hydrological neighborhood. But for the conservative influence of the soil, each individual would be utterly at the mercy of his neighbors so far as the purity of his water-supply is concerned, and to a certain extent he is still unprotected. In a physical sense

“ We share each other's woe ”

in every cup we drink. Communities are only beginning to understand the importance of keeping the water-ways and water-reservoirs safe from contamination. Every pond, stream, spring, and well is open to danger.

The first question for the sanitarian, then, is how to keep the soil-water pure, and not how to purify it after contamination. We demand *innocence* rather than *repentance* in sanitation.

Every individual has a personal interest in the condition and well-being of the soil-water of his neighborhood, and every unnecessary contribution to its defilement is a needless attack upon his civil rights.

It was under this conviction that the State Board of Health ordered an  
INQUIRY INTO THE INFLUENCE OF SAWDUST ON POTABLE AND CULINARY  
WATER IN MICHIGAN.

In carrying out this investigation I visited and examined certain localities where accumulations of sawdust have been in such quantity and for such period of time as would afford decisive indications of the influence of such organic matter on the potable and culinary water of such localities. I did not think it necessary to visit all places where such accumulations have formed, but to select a sufficient number to eliminate accidental variations.

#### SAWDUST CITIES.

The sanitary problems that confront some of our manufacturing cities where large quantities of lumber are made from pine logs, and where the difficulty of disposing of sawdust and mill-waste has led to the use of these materials for filling water-holes and low places, and made-lands of large area are seen, begin to attract the attention of those interested in the public health. In some places large areas of low ground but little above the water-level of the adjacent lake or river have been built up with sawdust until sufficient elevation has been secured to build houses on these made-lands. To such an extent have whole blocks and streets been built up with this saw-mill waste that the epithet “sawdust city” applies with singular force to some of our most enterprising business centers.

For centuries the world has pondered the problems of house building when “founded upon the rock,” or “built upon the sand,” but now we have the additional improvidence of the man who built his house upon the sawdust. The whole question of the relation of large quantities of decomposing organic matter to the public health in its widest aspect—wooden pavements, wooden sidewalks, wooden curbing for wells, and wooden walls for cisterns and cellars, as well as those vast embankments which line our rivers, and the acres upon

acres of marsh and swamp reclaimed for human habitation by a flood of sawdust that swamps the original flood, demands the careful consideration of the health authorities. I do not propose to enter upon all the sanitary problems of these sawdust cities, but to consider only the influence upon the water-supply.

#### ORGANIC MATTER IN POTABLE WATER.

The relation of organic matter in culinary and potable water to public health is a subject upon which sanitarians are much divided. Some consider such organic matter of no consequence unless it can be shown to be poisonous in its nature, or capable of producing disease when injected into the animal tissues: others consider organic matter of every kind in water for domestic use very objectionable. The readiness with which such organic matter will oxidize is an important consideration with some, while others lay great stress upon the source of such organic matter, whether it is of animal or vegetable origin.

The sanitary question regarding domestic water-supply considers not merely *what the water contains, but what can it produce?* No matter what it contains or does not contain, or what the source of such contamination, if the water contains disease germs IT IS DEADLY; if it is capable of nourishing and reproducing such germs when they find their way into such water, *it is dangerous*. Dr. Charles Smart, of the National Board of Health, has said with the force of truth, "It is not the dead organic matter which makes our water dangerous, but the living organisms." Here is a principle of first importance in sanitary problems of water-supply. All questions of organic carbon and organic nitrogen in water, and of their relations to each other give place to the one sanitary question, will this water nourish and propagate disease germs?

The question whether saw-dust water will sustain and develop disease germs requires further consideration and investigation. There may be some special conditions of food-supply for disease germs that are not required in other low forms of life. The fact, however, that a given water will sustain and propagate in abundance any of these low forms of life would lead us to regard such water with suspicion. If it is not enough to condemn such water at once, it is sufficient to raise grave doubts.

An excellent opportunity for observing the tendency to develop low forms of vegetable life was afforded in the fountains in Bay City and West Bay City. The parts of the fountain drenched with the spray, the basins, etc., were loaded with confervoid growth. This was seen in all the fountains in these two cities. If the sawdust-water of Grand Haven and Ludington were used in fountains, the same results might be expected. While these low vegetal growths may not be enough to condemn such waters outright, they are gravely suspicious. The questions whether the turpentine in small quantity in potable water, or the watery extract of pine wood, either fresh or modified by decomposition, are injurious when used for a long period, are not the only questions which confront us. These waters contain besides large quantities of organic matter, potash, soda, lime, magnesia, oxide of iron, ammonia, albuminoid ammonia, nitrates, sulphates, chlorides, and a small trace of phosphates—all the elements necessary to sustain vegetable life, especially such low forms as bacteria.

Take as an example the water from an open well in Grand Haven, excavated in a sawdust area, the well 7 or 8 feet deep, and the water-level only 3 feet below the surface. The water contained 26 parts solids in 100,000 parts of

water, 17 parts being volatile and organic. It contained 0.15 parts ammonia and 0.1 part albuminoid ammonia in 100,000. It contained so much combustible matter and nitrates in solution that on evaporating a litre in a large platinum basin and heating the residue at one edge, a brisk deflagration spread over the whole dish. Opposite the record of this water I made the following entry in my note book: "Let the germ of typhoid, the microbe of cholera, or the undiscovered bacterial cause of epidemic dysentery find its way into such waters, loaded with so much organic matter as food for an indefinite multiplication by reproduction, and what is to forbid such an outbreak of any one of these epidemics as would appall the stoutest heart! The possibilities of measureless woe lurk in these dark waters."

#### ARTIFICIAL SAWDUST-WATER.

The water derived from soils heavily charged with sawdust may derive its peculiar properties from other materials in the soil besides the sawdust. It was desirable therefore to find what would be the special influence of water charged with the salts that are usually present in soil water, on clean sawdust. For this purpose I filled three clean jugs about one-third full of fresh pine sawdust, and added to the first, well-water containing 6 grains bicarbonate of lime, 1 grain sulphate of lime, and nearly one grain of chloride of sodium in a gallon of water, to determine the effect of ordinary soil water on sawdust: to the second jug was added lime water: to the third jug water containing one per cent of bicarbonate of sodium. The jugs were corked up and left undisturbed in a cellar for two months. A quantity of water was filtered from each specimen and examined. The water from No. 1 (well-water) was of a brown color, about the same tint as the water from the pump-well of the water-works in West Bay City. During evaporation this water gave off a peculiar aromatic piney odor which continued to escape till near the close of evaporation. When the water was all evaporated there remained a thick tarry residue, which on strongly heating gave off a dense blackish smoke, the odor of burning rosin, and afterward of charring pine wood.

Another specimen of this water was evaporated to one-fourth its volume, acidulated with sulphuric acid, and then shaken up with ether, the ether decanted and evaporated on a water bath, when several grains of a yellowish-brown resinous matter remained, which had all the sensible properties of colophony, burned with the same bright flame and dense black smoke, and gave the same odor as common rosin.

Water No. 2 (lime-water) had a bright yellow color. During the evaporation it gave off the aromatic, piney odor more decidedly than No. 1. It left a tarry residue similar to No. 1, but greater in amount. The resinous character of the combustion, the odor, etc., were more pronounced than in No. 1. This water when evaporated to one-fourth its volume, acidulated and extracted with ether, gave results similar to No. 1.

Water No. 3 (bicarbonate of soda) was of a very brown color (like the water from Ludington), and gave off the piney odor during evaporation, but less marked. The room where these waters were evaporated acquired an odor that reminded one of the breath from piles of fresh pine lumber.

The quantity of tarry residue left on evaporating No. 3 was much larger than the residues from Nos. 1 and 2, the odor from the heated residue was more stifling, and the resinous character of the combustion more marked. The ether extract from this water was larger, and the resinous character of the deposit equally marked.



It is commonly considered that colophony and resinous materials of every kind in pine wood are not only insoluble in water, but that they exert a strong preservative influence upon such wood, preventing decay, and securing immunity from organic contamination of soil waters. But solubility and insolubility are relative terms; all substances of very sparing solubility are called insoluble. Very few substances can be called *absolutely insoluble*.

While rosin, as such, is insoluble in water, its combinations with the alkalies are readily soluble in water, and even the salts it forms with lime, magnesia, and oxide of iron have a sensible solubility. Storer in his Dictionary of Chemical Solubilities says of all these salts "sparingly soluble in water." The lime salt is soluble in 3,000 parts of water.

Whatever may be the facts in regard to the insolubility of these resinous principles in pure water in their separate form, it is evident that a certain degree of solubility attaches to them in their original combination in woody fibre when treated with water containing a small amount of alkaline carbonates or even alkaline earths. The soil-water in all parts of our State is charged with more or less carbonate of lime, and such water has a marked solvent action on certain principles in pine sawdust.

The organic matter in this artificial sawdust water is not merely suspended matter which will settle after a time and leave the water clear, but is dissolved in the water. In contact with iron it partially oxidizes after a time and forms a brownish deposit containing organic matter and oxide of iron.

#### NATURAL SAWDUST WATER.

The soil-water which has long been in contact with sawdust in quantity may be called natural sawdust water to distinguish it from the foregoing artificial product.

The localities from which specimens of this water were gathered and the special characteristics of the water are as follows:

*Ludington* is a very fair type of these sawdust cities. The soil is sandy, and the streets require some more coherent material to support travel, and sawdust is freely used to cover the streets to take the place of paving; much of the land along the lake front is low and water-logged, and sawdust is used in vast quantities to fill these low places and fit them for lumber and woodyards, and for building sites.

Fortunately Ludington does not now depend upon soil-water for her water-supply, having water-works that take water from Lake Michigan.

A specimen of sawdust water was obtained from an old and disused well, to represent the condition from which Ludington had escaped, and the danger to which other cities are still exposed. The water was of a brownish hue, nearly the color of cider. After standing for a few days in a closed vessel the water acquired a very offensive odor. To save repetition I will add that this offensive odor was present in all the natural sawdust waters I examined. The attention of many visitors at the Chemical Laboratory was called to this condition of these waters, and all expressed astonishment that waters capable of generating such foul odors should yet be taken for domestic use.

On evaporation this water left 32 parts of solid matter in 100,000, of which 15.8 parts were volatile and organic, and 16.2 mineral matter. During evaporation of all these natural sawdust waters a piney odor escaped, but less pronounced than in the fresh artificial sawdust waters. The residue left on evaporation was a dark tarry mass, which gave off a dark smoke during ignition, the odor of rosin, and at last a choking smell of charring pine wood. When

the water was evaporated to a small bulk, acidulated with sulphuric acid and extracted with ether, a residue was obtained on evaporating the ether of a resinous character, the odor melting point and flame resembling that of rosin. The water contained .25 parts of free ammonia in 100,000, and .125 parts of albuminoid ammonia. It held a sensible quantity of nitrates and traces of nitrites in solution.

*Grand Haven*, in certain districts, is characteristically a sawdust city. The water in Grand River is nearly on a level with much of the land lying along its borders. Sawdust has been freely used to build up these low lands, and densely populated parts of the city have been made habitable by its use.

Grand Haven has no water-works, and the inhabitants depend upon soil-water derived from wells for their domestic supply. Many of these wells are very shallow, the water coming within three or four feet of the surface, and the water is a cold infusion of sawdust. I have already spoken of the character of the water from one of these open wells near 6th street, and no further mention of its characteristics is necessary. Some of the citizens have attempted to secure a better quality of water by "drive wells" sunk to the depth of fifteen to twenty-five feet.

A specimen of water from a drive-well (fifteen feet deep) in a store in the same neighborhood, held 25 parts of solid matter in 100,000, of which 10 parts were volatile and organic and 15 mineral matter; it contained .15 parts of free ammonia and .075 parts of albuminoid ammonia in 100,000.

Another specimen of water from a drive-well about twenty-five feet deep (Dominic VanderVeen's) held 21 parts of solids in 100,000, of which  $7\frac{1}{2}$  were volatile and organic; it contained .025 free ammonia and .075 albuminoid ammonia in 100,000. Both these waters contained nitrates in sensible quantities and traces of nitrites. They held resinates in solution and yielded sensible quantities of rosin on evaporation and extraction with either. The residue from both these waters on being heated in a platinum dish gave black smoke and a stifling odor such as is given off on charring old pine sawdust.

The drive-well in the store had been abandoned as a source of culinary water because it seemed to cause sickness in every family where it was used. Intelligent residents were suspicious about the soil-water of the sawdust section, and anxious for an examination with reference to the introduction of pure water by city water-works and abandoning the soil-water for potable and domestic uses. The facts herewith set forth are a strong plea for pure water by bringing in a supply from uncontaminated sources by municipal water-works.

*West Bay City* is a typical sawdust city. Its river border was the marshy bank of the sluggish Saginaw River. The stirring enterprise of the people demanded yards, docks, and wharves for the storage and shipment of her vast accumulations of lumber, salt, and other products. These were built up along the whole riverfront by the use of saw-mill waste, and yards and docks replaced the ooze and slime of the sprawling stream.

In examining the water system of West Bay City I was greatly aided by its accomplished city engineer, Mr. Van Liew, who afforded every assistance in examining the water-works and in collecting specimens.

Three specimens of water were gathered, one from the water slip in Saginaw river, from which water is taken for the water-works; one from the pump-well or receiving tank from which the water is taken directly into the pump for distribution through the mains; and one from a hydrant.

The water-slip is a small arm of the river used for shipping lumber. It is built up on three sides with slabs and edgings, on the top of which a large

quantity of clay had been piled by dredging out the slip to render it deep enough for the vessels to be loaded from the wharves. The water was said to be from 14 to 17 feet deep. It was dark colored, the same as the water in the channel of the river, but it was claimed to be less muddy than water in the stream, because less disturbed by tugs and passing steamers. Large bubbles of gas rose from the bottom in rapid succession, and when the bottom was stirred a large quantity of gas came to the surface. A bottle full was gathered for analysis. It contains 88 per cent. of light carburetted hydrogen (methane) and 12 per cent. of nitrogen. It is marsh gas, which is always formed in the decomposition of organic matter under water.

The pump-well seemed to be designed for the double purpose of a receiving basin and settling tank. It is too small for either purpose, and being made of pine planks and timbers, and shut off from free contact with the air, it appeared to be a cause of contamination rather than a means of purification. When uncovered the water was found to be much darker colored than that in the water-slip, and the air over the water had a foul smell.

The water taken from these three points had a close resemblance in properties and composition. The most striking difference was the darker color and greater amount of organic matter in the water of the pump-well. For the purpose of direct comparison they are presented in tabular form.

WEST BAY CITY WATER WORKS. PARTS IN 100,000 OF WATER.				
Source of the Water.	Total Solids.	Volatile and Organic.	Free Ammonia.	Albuminoid Ammonia.
Water from water-slip.....	50	13½	.140	.10
Water from pump-well.....	52	15	.145	.10
Water from hydrant.....	50	14	.135	.10

Each of these waters on evaporation left a large tarry residue, which gave off the same black smoke and stifling odor as the waters from Ludington and Grand Haven. A common character in this respect runs through all the sawdust waters examined. These also contained soluble compounds of resinous matter the same as the other sawdust waters.

*Bay City.*—Through the kindness of E. L. Dunbar, superintendent of Bay City water-works, I obtained a specimen of water from a hydrant in Bay City and a specimen from Saginaw Bay, near the inlet of the receiving pipe of the water-works.

A comparison of these two specimens was desired by Mr. Dunbar to decide the question whether water conveyed many miles through wooden water pipes acquired organic matter from the wooden pipes.

Provision is made for letting water into the receiving pipe directly from Saginaw River "in order to afford an inexhaustible supply in case of fire." If any conflagration visits Bay City of such dimensions that Saginaw Bay would be pumped dry to extinguish the fire it would be good policy to bring Saginaw River under contribution.

Analysis of the water from the hydrant in Bay City shows a composition very similar to that taken from the hydrant in West Bay City. It contains 50 parts of solids in 100,000 of which 14 parts are volatile and organic, and



differs mainly in having a little less ammonia and albuminoid ammonia than West Bay City water.

The water from Saginaw Bay contains only 30 parts of solids in 100,000, of which  $8\frac{1}{2}$  parts are volatile and organic. This would seem to confirm the suspicion that the water conveyed a long distance in wooden pipes had taken up organic matter from the pipes; but other considerations render this explanation untenable. The water of Saginaw River contains a sensible amount of chlorides from the waste of the salt-wells emptied into the river. When this river-water is diluted by mingling with the waters of Saginaw Bay, the amount of chlorides and of organic matter in a given amount of water will be proportionally reduced. The chlorides reckoned as common salt (chloride of sodium) in the hydrant water of West Bay City amounts to  $37\frac{1}{2}$  parts in 100,000, while the water in Saginaw Bay contains only 12 parts. If the hydrant water in Bay City came from Saginaw Bay, and the change in the amount of organic matter was from the wooden pipes, there should be no increase of common salt in this water, because wood does not turn to salt. But the hydrant water from Bay City contains 29.15 parts of common salt in 100,000 parts of water. If one-third of this hydrant water came from the Bay and two-thirds from the river, then it ought to contain 29 parts of common salt, whereas it does contain 29.2 parts. If this hydrant water was thus made up by mixture of bay and river waters, the bay water containing  $8\frac{1}{2}$  parts of organic matter, and the river water 14 parts, the amount of organic matter in the Bay City water ought to be 12.2 parts, while it has 14; thus showing that it can only have taken up 1.8 parts of organic matter from the pipes for every 100,000 parts of water carried by them.

I close this discussion with five general conclusions.

1. These sawdust-waters all contain an amount of organic matter sufficient to condemn them for potable and culinary use.
2. They all contain resinous extractive matter in solution.
3. They all contain nitrogenous material capable of yielding albuminoid ammonia greatly in excess of the sanitary limit.
4. They contain all the chemical elements necessary to sustain low forms of plant life.
5. In the presence of so large an amount of organic matter and the chemicals of plant life, these waters may become dangerous by nourishing and reproducing the germs of epidemic disease, should they find lodgment therein.

# THE RELATION OF THE DEPTH OF WATER IN WELLS TO THE CAUSATION OF TYPHOID FEVER.\*

BY HENRY B. BAKER, M. D., LANSING, MICHIGAN.

During the last six months of the year 1881, and the first three months of 1882, sickness from typhoid fever was, I believe, much more than usually prevalent in the State of Michigan. The evidences of the truth of this statement are found in the Annual Reports of the Michigan State Board of Health; and they consist of replies by regular correspondents to questions asked by the Board,† and of tables compiled from weekly reports of sickness, made by health officers and other prominent physicians in different parts of the State.‡ Of forty-three correspondents, eleven reported typhoid fever (and nine reported typho-malarial fever) unusually prevalent in 1881, while only one reported typho-malarial fever and not one reported typhoid fever as less than usually prevalent in that year.

TABLE 1.—*By year and months for each of the six years 1878-83, and on an Average for the Five Years 1878-82, stating on what Per Cent of the Weekly Reports of Diseases received Typhoid Fever was reported present.*

YEARS.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 yr. 1878-82	13	12	11	8	6	6	6	8	15	22	25	23	17
1878-----	10	12	9	7	4	7	6	6	10	13	18	11	12
1879-----	12	6		6	8	3	4	5	14	20	24	25	17
1880-----	14	8	13	7	5	6	5	10	19	26	23	22	17
1881-----	18	13	10	7	5	6	6	12	23	35	37	32	25
1882-----	14	21	16	12	8	7	9	8	11	17	23	23	16
1883-----	11	11	7	7	7	6	7	6	11	19	21	17	14

By the table (No. 1), which is here submitted, it may be seen that, beginning with July, 1881, the sickness reported from typhoid fever was about fifty per cent greater than the average for corresponding months in the five years 1878-1882, and it continued at this high rate until April, 1882.

\* This paper was read before the American Public Health Association, at St. Louis, Mo., October 16, 1884.

† pp. 285-9, Report 1882.

‡ p. 568, Report for 1882, and p. 241, Report for 1883.

DIAGRAMATIC TABLE No. 2.—*Exhibiting Correspondence in Time and Place Between unusually Low Water in Wells and the Occurrence of Typhoid Fever, in Michigan in 1881. Data obtained from Replies by Correspondents and from Weekly Reports of Diseases.*

[illegible]

 Water low.  Typhoid fever.  Typho-malarial fever.

\* Muskegon has a general water-supply from a ravine on the banks of which are privies.



For this increased prevalence of typhoid fever, a variety of supposed causes were alleged by the physicians who reported, but, taken altogether, the alleged causes seem at first sight nearly to negative each other, the number alleging excessive rainfall, wet soil, etc., at some time during the year, about equaling the number who alleged unusual drouth as the cause of the sickness. But by a careful study of the evidence relative to the condition of the soil and of the ground-water, immediately preceding and during the prevalence of sickness from typhoid fever, it is found that it was one of unusual drouth and low water in wells, in quite a number of different parts of the State, beginning with July, 1881, and that, although the rainfall later in the year was sufficient to make the surface-soil moist, the water in wells continued unusually low. It was especially low in July, August, and September, 1881. From reports by meteorological observers for the Michigan State Board of Health for the summer and autumn months in 1881 I quote as follows: Dr. J. S. Caulkins, M. D., of Thornville, says, "July has been a very hot and dry month. \* \*

\* Crops are badly injured by the drouth. August has been a dry, hot month. Vegetation has suffered beyond all record. At a short distance a pasture cannot be told from ploughed field. \* \* \* The crops are almost a total failure." Dr. Jas. S. Reeves says, "The driest ever known here." For October, Dr. Caulkins says, "In spite of the heavy rainfall, water has not risen in the wells and springs, and below the wet there is a stratum of dry earth one or two feet in thickness." At the close of the year, Dr. Caulkins reports, "December has been a warm, open month, with scarce any snow, and very bad roads. There is no frost in the ground worth speaking of as the month closes. No ice in the lakes and streams. *Water is still low in spite of all the rains we have had.*"\*

I submit herewith a diagramatic table (No. 2) in which is summarized the evidence which seems pertinent, that was contained in replies by regular correspondents of the Michigan Board of Health, relative to the months in the year 1881, in which the ground-water, as observed in wells, etc., was unusually low, and the months in that year in which typhoid fever occurred under their observation. It may be seen that in quite a number of localities observers have made records which show either a coincidence between the low water and sickness from typhoid fever, or that the fever occurred in months succeeding the low water.

I have shown that the *sickness* from typhoid fever in Michigan was unusually great in the last part of the year 1881 and first part of 1882 compared with other years, according to reports extending back to 1876. I submit herewith a table (No. 3) showing that the *deaths* from typhoid fever were also unusually numerous in the year 1881, compared with other years. The mortality statistics extend back to the year 1866.

I have compared reports of the meteorological and other conditions in the years 1881-82 with those for other years; and I find no condition, concerning which we have records, that varied in such manner as to explain the unusual prevalence of typhoid fever in those months, except the condition of the ground-water, as indicated by the lowness of water in wells. The temperature of the atmosphere was unusually high during those months; but to high temperature of the atmosphere the causation of typhoid fever has never been directly traced; the disease occurs in cold as well as in hot climates, and

\* Dr. N. S. Davis reports a very dry summer in 1881, with an exceptionally high typhoid death-rate in Chicago (*Chicago Med. Jour. and Examiner*, Feb., 1882, vol. 44, pp. 113-117); and a very destructive drouth appears to have prevailed during the summer of 1881, over a large portion of the eastern United States (H. H. Clayton, Jr., in *Am. Meteorological Journal*, Aug., 1884).

TABLE 3.—Deaths Returned as having occurred from Typhoid Fever in Michigan, in each of the 16 Years 1867-82, by Sex, and by Months.

SEX.	MONTHS AND YEAR.													Year.	Years.
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Unknown Month.		
Total.....	36	28	24	22	9	13	19	21	42	60	48	37	2	361	1867
Males.....	21	16	13	11	3	7	9	13	22	28	24	18	1	186	
Females.....	15	12	11	11	6	6	10	8	20	32	24	19	1	175	
Total.....	36	28	24	17	14	11	18	45	72	84	31	49	1	430	1868
Males.....	21	16	13	8	8	7	6	27	37	43	15	29	—	230	
Females.....	15	12	11	9	6	4	12	18	35	41	16	20	1	200	
Total.....	17	18	31	18	27	16	21	51	76	79	45	38	—	437	1869
Males.....	8	10	19	11	16	8	10	25	36	40	25	20	—	228	
Females.....	9	8	12	7	11	8	11	26	40	39	20	18	—	209	
Total.....	10	17	33	12	17	17	34	64	106	117	94	52	1	574	1870
Males.....	7	11	9	6	7	6	18	32	50	59	38	27	—	270	
Females.....	3	6	24	6	10	11	16	32	56	58	56	25	1	304	
Total.....	16	26	25	23	25	21	15	37	59	41	34	32	3	357	1871
Males.....	8	15	8	9	13	8	9	18	37	25	23	17	2	192	
Females.....	8	11	17	14	12	13	6	19	22	16	11	15	1	165	
Total.....	15	25	26	40	25	24	14	39	106	129	97	78	2	620	1872
Males.....	6	12	13	22	15	15	7	22	59	75	54	39	1	340	
Females.....	9	13	13	18	10	9	7	17	47	54	43	39	1	280	
Total.....	39	45	32	39	22	24	36	62	103	144	77	50	4	677	1873
Males.....	23	22	17	24	12	14	16	37	56	83	45	34	2	385	
Females.....	16	23	15	15	10	10	20	25	47	61	32	16	2	292	
Total.....	33	23	22	24	31	24	30	50	104	123	92	51	3	610	1874
Males.....	12	16	12	16	13	12	13	26	59	62	46	30	—	317	
Females.....	21	7	10	8	18	12	17	24	45	61	46	21	3	293	
Total.....	30	16	21	23	17	22	22	29	55	92	63	40	3	433	1875
Males.....	12	10	9	16	8	15	12	15	31	50	32	22	—	232	
Females.....	18	6	12	7	9	7	10	14	24	42	31	18	3	201	
Total.....	18	18	19	20	17	19	29	54	82	66	49	34	1	426	1876
Males.....	8	10	11	13	8	11	13	33	34	42	29	21	—	233	
Females.....	10	8	8	7	9	8	16	21	48	24	20	13	1	193	
Total.....	14	13	25	18	24	9	18	54	83	85	58	43	2	446	1877
Males.....	8	5	10	11	11	5	11	29	44	44	32	22	2	234	
Females.....	6	8	15	7	13	4	7	25	39	41	26	21	—	212	
Total.....	11	13	16	14	21	13	21	42	54	52	41	31	—	329	1878
Males.....	3	10	7	7	14	9	9	22	28	25	25	17	—	176	
Females.....	8	3	9	7	7	4	12	20	26	27	16	14	—	153	
Total.....	15	24	24	23	13	11	18	48	53	61	55	52	—	397	1879
Males.....	7	11	14	10	7	3	10	25	26	26	27	24	—	190	
Females.....	8	13	10	13	6	8	8	23	27	35	28	28	—	207	
Total.....	22	13	22	28	20	19	35	73	92	87	58	44	—	513	1880
Males.....	9	6	10	17	13	11	23	38	58	43	31	26	—	235	
Females.....	13	7	12	11	7	8	12	35	34	44	27	18	—	228	
Total.....	20	15	23	34	27	35	45	99	150	178	149	108	1	884	1881
Males.....	13	9	14	21	14	23	26	49	79	83	93	67	—	491	
Females.....	7	6	9	13	13	12	19	50	71	95	56	41	1	393	
Total.....	31	34	30	18	35	30	20	* 27	52	91	53	40	2	463	1882
Males.....	19	20	17	11	19	15	9	13	26	54	36	28	2	269	
Females.....	12	14	13	7	16	15	11	13	26	37	17	12	—	193	
Total.....	363	356	397	373	344	308	395	795	1,289	1,489	1,044	779	25	7,957	1867 to 1882†
Males.....	185	199	196	213	181	169	201	424	682	782	575	441	10	4,258	
Females.....	178	157	201	160	163	139	194	370	607	707	469	338	15	3,698	
Total.....	99	99	115	117	116	108	139	289	401	469	356	275	3	2,586	1878 to 1882†
Average.....	20	20	23	25	23	22	28	58	80	94	71	55	—	517	

\* Includes one "unknown sex."

† Inclusive.

in cold as well as in hot seasons of the year; and although in Michigan it follows the hot weather of summer, in some other countries it follows the cold season. On the other hand, the disease has many times (hundreds of times, I suppose) been traced directly to the use of contaminated drinking-water.

There is one other closely-related physical condition that it would seem may have influence in the causation of typhoid fever, namely, the *temperature of water in wells*, and of the fluids in privies. The temperature of water in wells is recorded and reported each month from some localities in Michigan; and some study has been given that subject in the preparation of this paper; but the changes in the temperature are so slight that it is difficult to see how they can have *great* influence. Moreover, any effect this may have is so hidden in the greater changes in the quantities of water in wells, usually coincident with if not one cause of the changes of temperature therein, that it is difficult to distinguish separate influences, if such there are.

From the foregoing it appears that in Michigan there is a relation between low water in wells and the prevalence of typhoid fever; that this relation is found to hold by seasons of the year,—those months in which the water is lowest (or the months immediately following) being the months in which typhoid fever is most prevalent; and the unusual year 1881–2 when typhoid fever was more prevalent than ever known before, was also unusual because of the exceeding low water in wells.

A relation of low water in wells to the prevalence of typhoid fever being considered established, several questions arise:—

1. Is there a quantitative relation? That is to say: Is the amount of sickness from typhoid fever proportional to the amount of water in wells?
2. Does the drinking-water cause the typhoid fever?
3. What constituent of the drinking-water causes the typhoid fever?
4. How can typhoid fever be prevented?
5. What need is there for the prevention of typhoid fever in Michigan?

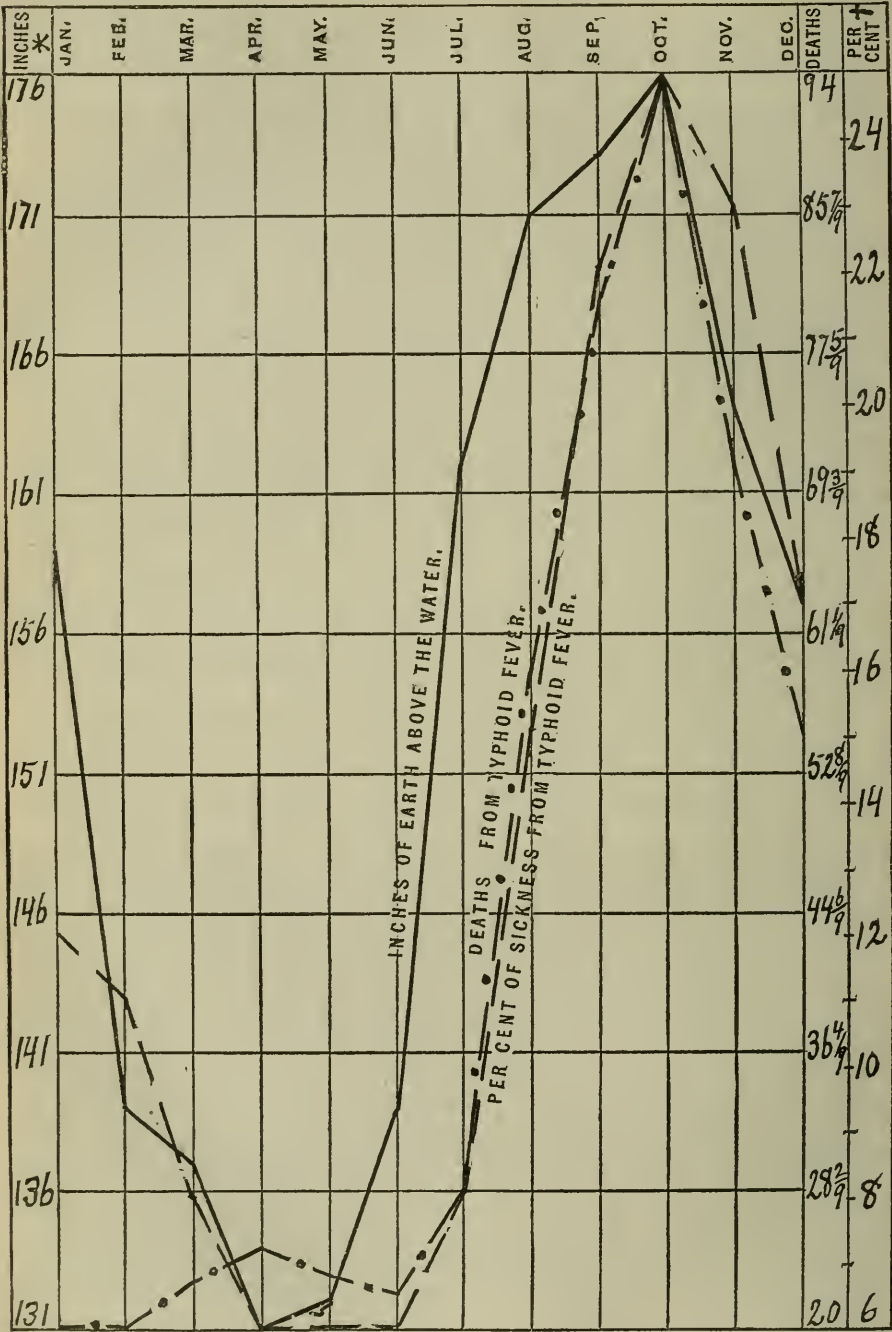
IS SICKNESS FROM TYPHOID FEVER INVERSELY PROPORTIONAL TO QUANTITY OF WATER IN WELLS?

At first glance it may seem to be impracticable to measure and compare quantitatively such dissimilar things as water in wells and sickness from typhoid fever. Yet whenever we can get the statements of the facts such comparisons are now not difficult. We have only to construct diagrams on the proper principle, and accurately drawn according to definite scales. It may be well to say here, that the way to do this is to so plan the diagrams and the scales by which the two or more things to be compared are to be shown that the *extremes* of the two or more things to be compared (the highest and lowest statements in the diagram) shall be the same distance apart,—in which case the greatest range of the statements for each will appear to be the same. In a diagram prepared in accordance with this principle, if there is a fixed and definite quantitative relation between the things compared, it will be apparent; because the greatest ranges of the several things compared being *made* to coincide, the minor fluctuations will also coincide in the amount of space they occupy on the diagram. This will be true as regards the *amount* of the fluctuation, even though the fluctuations may not exactly coincide in point of *time*,—even though one of them, for instance, be constantly in advance of the other in time.

This principle, just stated, has been held in mind in the preparation of the diagrams which I present to you, and which show the relation of the depth of



DIAGRAM A.—Exhibiting, for a Period of Five Years (1878-82) the Average Monthly Oscillations of Ground-water in Michigan, the Deaths from Typhoid Fever, and what Per Cent of the Weekly Reports of Sickness Received Stated the Presence of Typhoid Fever.



\* Inches of earth above water in wells.  
 † Of all weekly reports received, per cent stating presence of typhoid fever.  
 NOTE.—The sickness-curve should rise and fall later than the curve for its cause by about the

the earth above the ground-water in wells in Michigan, and the prevalence of sickness from typhoid fever in Michigan by months in each of the years 1878, 1879, 1880, 1881, 1882, and 1883, also an average for five years,—1878–82, this diagram also including statements of the deaths in Michigan from this cause during the same five years. In these diagrams, statements of the “depth of earth” above the water in wells, have been employed; because if statements of the “depth of water” in wells were used the scale would, if upright, have to be the reverse of that used for the statements relative to the sickness, and therefore would not be as easy of comparison. In studying these diagrams, one will need to bear in mind that whenever the “depth of earth” over the water is great, the depth of the water in wells is low, and *vice versa*.

#### WHAT THE DIAGRAMS SHOW.

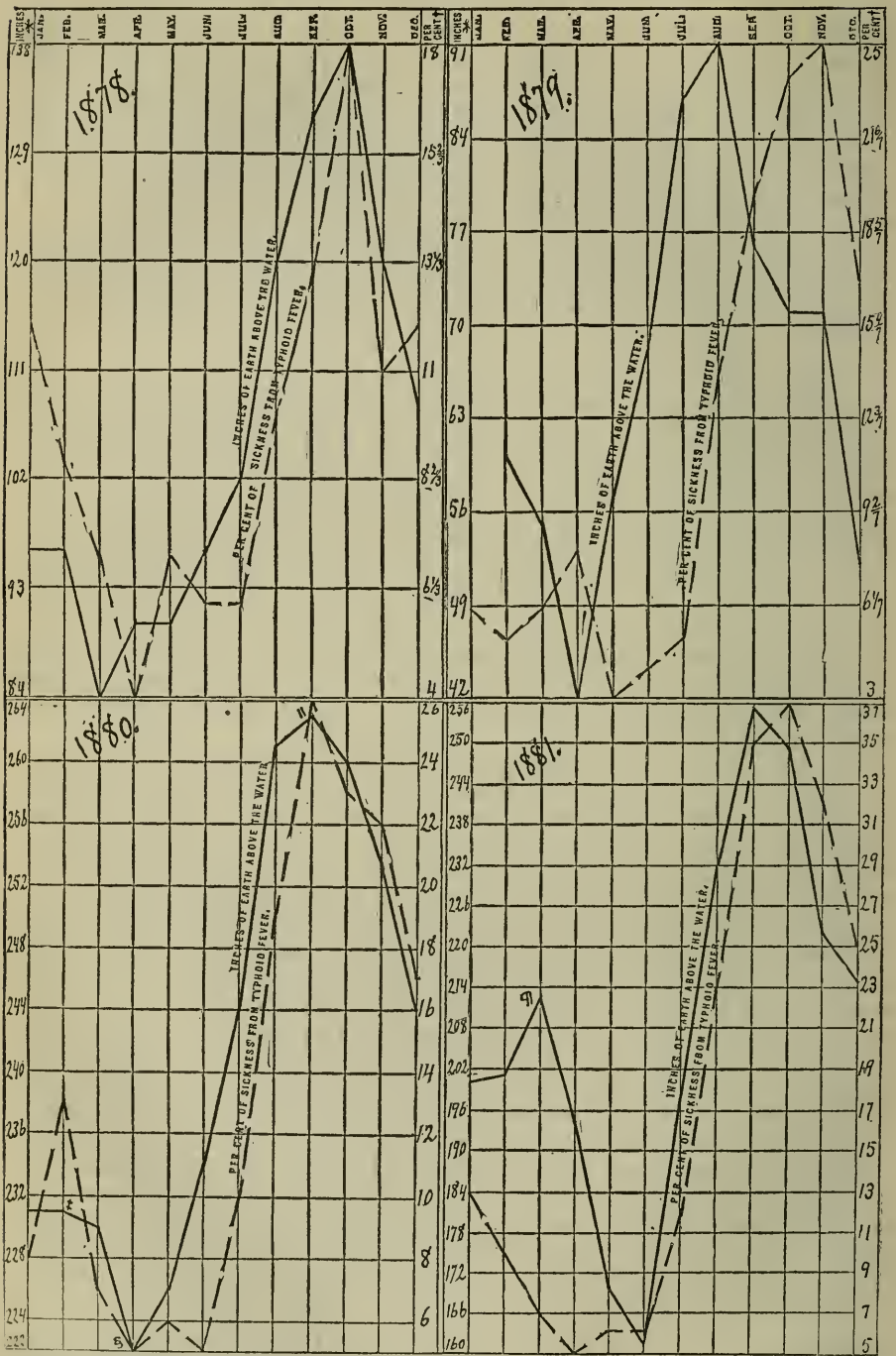
In the several diagrams which I present, the statements of the sickness from typhoid fever relate to the State of Michigan as a whole,—being summarized from weekly reports of physicians in many parts of the State. The wells measured for these diagrams are not the same in number in both years; and they are not the same wells in both years; so that from the diagrams alone no comparison can be made of one year with the other as to the exact height of the water during the year as a whole, or of one month with the corresponding month in another year. The comparisons intended to be shown are of one month with the others in the *same* year. The number of wells was very few; but an examination of the subject seems to show that it is sufficient to fairly indicate for each year the rise and fall of the ground-water throughout the State,—the curves are as nearly alike as one would expect them to be in different years.

From the diagrams it may be seen that, beginning with June in each year, the sickness from typhoid fever follows more or less closely the curve representing the average depth of earth above the ground-water. If the sickness is caused by the low water there is a good reason why the curve of the sickness should *follow* the curve representing the lowering of the water; because the statement of the sickness is: What per cent of weekly reports received stated that typhoid fever was under observation during the week for which the report was made; and as the disease lasts for about three weeks, and as cases taken sick in preceding weeks will remain under observation until death or convalescence and be reported together with those just taken sick, the curve for sickness would, when rising or falling, necessarily lag behind the curve representing the cause of the disease, by about the average duration of the disease. As there is in this disease an incubation period of varying length, but which may be ten days, two weeks or even more, this would still further postpone the sickness, compared with a curve representing its cause. Usually a few days' sickness pass before the doctor is called and the disease recognized and reported as typhoid fever. So that if low water causes the sickness, we would expect as a rule to find the changes in the amount of sickness to appear to lag behind the changes in the level of the water by nearly one month. This is very nearly what we do find shown by the diagram on page 94 relative to the average for the five years, and with respect to each of the years

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length of the period of incubation plus about the av. duration of the disease; because the reports of sickness include all cases under observation, old cases and new cases. The time-unit of the diagram is so great (one month) that the interval between the two curves is sometimes greater and sometimes less than the interval between the cause and its consequent sickness.

DIAGRAM B.—Exhibiting the Rise and Fall of Water in Wells, and of Sickness from Typhoid Fever, in Michigan, in each of the Four Years 1878-81.



\* Inches of earth above the water.  
 † Of all reports received for the given month, the per cent stating the presence of typhoid fever.  
 ‡ Well-water high, but not protected by frozen ground; organic matter decomposing.  
 § Depth of earth above the water least,—water highest; least sickness from typhoid fever.  
 || Depth of earth above the water greatest,—water lowest; most sickness from typhoid fever.  
 ¶ Well-water low, but protected by frozen ground.

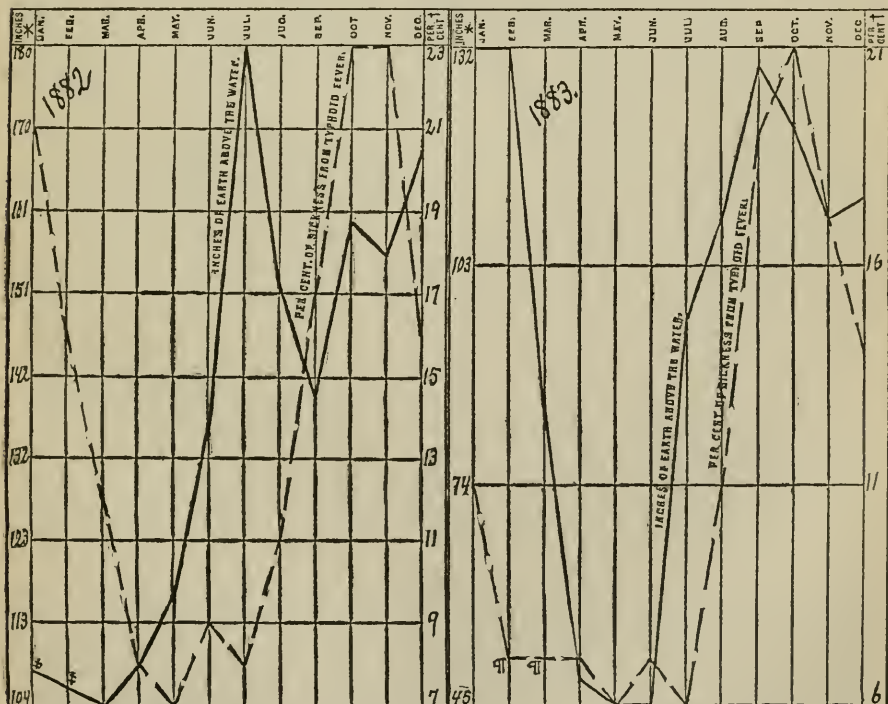


1878, 1880, 1881, and 1883,\* namely, that the rise or fall of the disease appears to be greatly influenced in any month, after May or June, by the level of the water in that same month, but that the influence extends over into the succeeding month.

The comparison between the depth of water in wells and the sickness from typhoid fever being so close for every month after June, what is the reason for the want of correspondence in several years from January to June? By the diagram for the year 1881 it may be seen that the earth above the water increased from January to March and decreased from March until June, while the sickness seemed to decrease because of the low water in wells in March, and to increase in consequence of the rise of water in April. In considering this subject, it seemed to me that the cause of the low water in March, 1881, might be the great depth to which the ground was frozen; and that the reason why the sickness was decreased might be that the privies and other sources of typhoid contamination were also frozen, and the liquid therefrom prevented from descending to the water in the wells. The water in the wells would then be derived in greater proportion by percolation from a distance, in some cases from streams not frozen. In either case, whether the water in wells came

\*If the diagrams were made by weeks instead of months it might be found that the relation is more definite and constant than appears by these diagrams; but this remains to be ascertained.

DIAGRAM C.—Exhibiting the Rise and Fall of Water in Wells, and of Sickness from Typhoid Fever, in Michigan, by Months, during each of the Years 1882, 1883.



\* Inches of earth above the water in wells.

† Per cent of reports of sickness from typhoid fever.

‡ Well-water high, but not protected by frozen ground; organic matter decomposing.

§ Well-water low, but protected by frozen ground.

from a distant stream above ground, or from the general level of the ground-water, the ground above being frozen deeply, the water which enters the wells would be filtered much more slowly through the deep strata of the earth than is the case when rain passes freely down to wells through foul surface-soil. To learn whether this supposed explanation accorded with the facts, I have turned to the reports by the meteorological observers for the State Board of Health of Michigan, and I find they reported relative to the weather in the first part of the year 1881, as follows:—

*January.*—"January was a very cold month. Ice about 25 inches thick; ground deeply frozen."—*John S. Caulkins, M. D., Thornville.* "January 1881 was the coldest, judging from its mean temperature, of any January since 1875. The mean temperature was 14 degrees."—*Sergt. Jas. A. Barwick, Alpena.*

*February.*—"Nights of February 23 and 24 were the coldest recorded since the first opening of the signal office in this city, minimum thermometer registering  $-27^{\circ}$ ."—*Sergt. Jas. A. Barwick, Alpena.* "The month has been stormy and quite variable in temperature, which is below the mean of several years."—*John S. Caulkins, M. D., Thornville.* "Ground frozen four feet deep."—*Lee S. Cobb, Winfield.* "Frost four feet deep in the cemetery, soil, sand, and gravel."—*Francis D. Parmelee, Hillsdale.* "Thickness of ice put up in ice-houses, 26 inches. Average depth of frozen earth in cemetery, 3 feet."—*Edwin Stewart, M. D., Mendon.*

*March.*—"Ground frozen to the depth of 18 inches."—*Sergt. Jas. J. Fitzgerald, Alpena.* "About five inches of snow on the ground as the month ends. Frost in the ground is not deep. The lakes and ponds are still frozen. A very wintry March,"—*John S. Caulkins, M. D., Thornville.* "Ice began to move in Grand River March 28."—*Lansing.*

*April.*—"Ice in bay beginning to crack in many places; will soon be gone; navigation not yet open."—*Sergt. Chas. Dill, Escanaba.* "Frost disappeared from the ground about the 25th. Navigation opened on the 29th."—*Sergt. Jas. J. Fitzgerald, Alpena.* "April has been a cold, backward month, and closes with the prospect not improved. Remains of snow drifts were seen as late as the 22d."—*John S. Caulkins, M. D., Thornville.* "Depth of ground frozen, three and one-half to four feet. Time of disappearance of frost from the ground, about the 25th."—*H. Peters, M. D., Tecumseh.*

The great depth to which the ground was frozen in February and March will, I think, explain the great freedom from typhoid fever in Michigan in March, 1881. If this is the true explanation, it indicates that the condition of the low water in wells is generally not productive of typhoid fever when the comparatively low water is protected by a deep freezing of the privies, cess-pools, and the general surface of the earth. We have previously seen, and it is apparent from several of the diagrams, which I present, that from June to December low water in wells is *not* favorable to freedom from typhoid fever.

Turning now to the diagram representing the relation of water in wells to typhoid fever in Michigan in the year 1880, it is noticeable that in the early months of that year the water was *high* (the depth of earth above it was not great), and that the typhoid fever was also high. The reasoning adopted relative to the early months in 1881, where the deeply-frozen ground was believed to have prevented typhoid fever, would lead us to suppose that the well-water was *not* protected by frozen ground in 1880. Inspection of the records (in the Annual Report of the Michigan State Board of Health) shows

that this is true, that in Michigan the earth was *not* as deeply frozen as usual during the months of January and February, 1880. In January, the average temperature for 15 stations in different parts of Michigan was above the freezing point, being 34.06° F. In February, the average was 27.93°, and in March, 31.00° F. Dr. Stewart, observer at Mendon in southwestern Michigan, reported: "Considerable plowing has been done in this county during the month of January;" Dr. Caulkins, observer at Thornville, reported for January, 1880: "There is no snow, no ice in streams and ponds, and scarcely any in the ground." Dr. Peters, of Tecumseh, reported for February: "Frost all out of the ground February 28. Streams froze up and thawed out three times during winter, ice at no time more than six inches thick. Not more than half the usual amount of ice was put up." Dr. Caulkins reported for February: "The ice crop is a total failure. February has been very mild for this latitude, and so much freezing nights and *thawing days has materially injured the clover.*"

The unusual prevalence of typhoid fever in Michigan in February, 1880, is probably fairly attributable to the unusually mild weather in January and February, and to the lack of protection usually afforded by the frozen ground at that season of the year to the water in wells, which water, by reason of the injury to vegetation by alternate freezing and thawing, was probably unusually contaminated by decomposing organic matter, in addition to the leaching from privy-vaults.\*

From the evidence in the tables, diagrams, and comments in this paper, it may be seen that not only in the spring of 1880, but in the early part of other years, typhoid fever was prevalent coincidentally with an unfrozen surface of the ground. The year 1882 is another example of high ground-water and high rate of *sickness*, during the first few months of the year. By reference to the reports of meteorological observers for the Michigan State Board of Health it is found that February and March, 1882, were unusually mild months. The observer at Lansing records for February: "Frost Feb. 9. River opened Feb. 13, closed Feb. 21, and opened again Feb. 25. Robins came back Feb. 22." Dr. Caulkins writes at the close of February: "Nights that no ice formed, 7, 12, 13, 16, 27, 28. A warm and pleasant month for the season, with no sleighing, and noteworthy for the six days without freezing. Wheat seems not to be in the least injured by the freezing and thawing and the lack of snow, but looks excellent. As the month goes out there is not a particle of ice in sight,

\*In this connection the following from the Massachusetts Board of Health Report for the year 1871 is of interest:—

"A large house in this village [Sutton] is supplied with water from a well in the front yard, three rods from the house. Connected with the house is a barn without cellar, some three rods from the well. In December, 1868, a trench three or four feet deep was dug from the well to a point near the middle of the barn, where a pump was set and a pipe connecting it with the well was laid in the trench; after which the earth, which was in large frozen chunks, was filled back into the trench. In the house was kept a boarding-school for boys, of whom there were ten or twelve. Three little girls were also there, aged twelve, eight, and three years, belonging to the family of the owner of the house; there were therefore fourteen or fifteen children who drank from the well. The oldest boy was seventeen or eighteen years old, while the others were of ages from ten to thirteen. Everything went well until after the thaws in February and March, 1869, when the water had a decided taste and smell of stable-manure. March 26, one of the boys, thirteen years old, was seized with typhoid fever; another, twelve years old, on the 31st of March; another, eleven years old, April 2; another, ten years old, April 4; and another, twelve years old, April 9. April 20, one of the little girls (eight years old) was seized. Each of these six children (all of whom finally recovered) drank water with their meals from the well in the yard. Some of the other boys drank coffee in the morning and tea at night. The manner in which these children were attacked, and the fact that this house had been free from typhoid fever for many years, and the water heretofore known to be very pure and wholesome, leads me to the conclusion that the use of the water thus impregnated was the cause of the disease occurring where and just at the time it did. My theory is that while the ground, manure, etc., under the barn were frozen, the water was all right; but when it thawed, and the previously frozen filth leached through the soft and loose earth along the track of the pipe into the well, the effect of the poison was felt most perceptibly by those who used the polluted water most freely, while those who used it less freely escaped entirely."



and little frost in the ground. Robins came back as early as Feb. 22, and blue birds soon after. Blue flies and mosquitoes have been seen." Dr. Caulkins writes again at the close of March: "March in spite of some cold weather, has been a warmish month. As it closes there is scarcely any ice in the ground. Wheat looks uncommonly well, but the last year's seeding of clover is pretty much all killed by the repeated freezings."

We thus reach the conclusion that, in Michigan at least, the relation of the depth of water in wells to typhoid fever is not the same in summer as in winter; that in summer when vegetation is active and not decaying, a lowering of the water is uniformly followed by increased prevalence of typhoid fever; with the advent of colder weather, there is a rise in the water-level which is uniformly followed by a decreased prevalence of the fever; that this decrease continues through the winter and spring, even though the level of the well water is lowered, *provided* the surface of the earth is deeply frozen; that on the contrary, *high* water-level in wells in winter and spring, coincident with ground *not* thoroughly frozen, is followed by *increased* prevalence of the fever. Briefly stated, the typhoid fever follows *low* water in summer, and *high* water at that season of the year when the ground is usually thoroughly frozen. (Although I find little evidence of it as yet, we may expect to find that high water in winter and spring may not necessarily be followed by increased prevalence of fever, if it is coincident with a deeply and continuously frozen surface of the ground.)

As regards bronchitis, pneumonia, and other diseases caused by cold weather, it does not seem to be true that they are more prevalent in a mild than in a severe winter. But as regards typhoid fever in its relations to contamination of ground-water, as herein set forth, there seems to be a partial explanation of the old saying, "A green Christmas makes a fat graveyard."

#### WHAT CONSTITUENT OF THE DRINKING WATER CAUSES THE TYPHOID FEVER?

Typhoid has been known to occur after the drinking of water contaminated by decomposing vegetable matter (turnips in one instance\*); by decomposing *animal* matter (a turtle in one instance†); also in the autumn succeeding a hot summer in which diarrhea had been unusually prevalent; and the unusual fouling of the water-supply by the extra quantity of fecal discharges under these circumstances has been supposed to have causative relation to the typhoid fever which succeeded it. All this receives explanation if we accept the doctrine that typhoid fever is caused by bacteria; because bacteria require for their growth and multiplication a nutritive solution,—either mineral (such as Pasteur's), or vegetable, or animal, very few, if any, of the many species of bacteria being able to reproduce themselves in great numbers in *pure* water. This last statement seems to me to be evident to those who have used the microscope much; yet I may quote from a high authority as follows: Dr. Robert Koch, in his recent address on cholera, before the Imperial German Board of Health, is reported to have said: "I would not certainly assume that the multiplication of the comma-bacillus outside of the human body takes place in well-water or in river-water without any assistance, for these fluids do not possess that concentration of nutritious substances which is necessary for the growth of the bacilli."‡ Dr. Koch was, however, able to reproduce the comma-bacillus in meat juice, and other

\* *Sanitary Record*, London, Jan. 29, 1876, vol. iv., pp. 81-82.

† Annual Report Mich. State Board of Health, 1876, pp. lxii-lxiv.

‡ *British Medical Journal*, Sept. 6, 1884, page 456.

nutritive solutions. After mentioning the growth of bacteria in stagnant water, and that "the continuous flow of water prevents the formation of a local concentration of nutritive substances in the liquid sufficient for pathogenic bacteria," Dr. Koch further says:\* "The connection between the falling of the subsoil-water and the increase of several infectious diseases, I would explain as follows: that when the subsoil water falls, the current that takes place in the subsoil-water is much less significant. Besides, the quantities on the surface are much diminished, so that those concentrations, which I assume to be necessary for the growth of the bacteria must much sooner take place." I venture to suggest that the evidence we now have of the causation of typhoid fever renders it necessary that we substitute for Dr. Koch's diminished quantities of fluids "on the surface," *diminished quantities of water in wells* as more *directly* causative of typhoid fever; because that disease is *not* frequently traced to transmission through the air, but is frequently traced to the use of bad water; so that aside from such evidence as that which I present to you at this time,—we have good reason to believe that in some way typhoid fever is frequently caused by the drinking of contaminated water. The cases recorded are exceedingly numerous. References to a few of them are as follows:—

#### NEUCHÂTEL OUTBREAKS.

A mild, extensive epidemic of typhoid fever occurred in Neuchâtel, Switzerland, in the fall of 1882. There were six hundred and twenty-three cases between September 14 and October 20, and the total cases in the period covered by the epidemic, included 5 per cent of the entire population. All classes were taken and the outbreak occurred in all parts of the city at the same time. The water drinkers suffered most, and, so far as reported, those who drank only beer escaped entirely.

The city water supply is brought by an aqueduct from the Seyon, a mountain stream, torrential in spring and during rains, but small in summer. This stream with its affluents drains the Val-de-Ruz, and on its banks above Neuchâtel are many small villages. A careful investigation authorized by the government, showed the following condition: The drinking water is taken from the Seyon directly below the town of Valangin; there are twenty other little villages higher up the valley. Slaughter-houses, pig-sties, cess-pools, sewers, and privies were found in close proximity to the stream, and with liquid contents oozing in some cases directly into the stream. A public laundry much used by several villages is also situated on the banks of the stream and the wash water flows directly into it. Ordinarily the water of the Seyon is pure, but during heavy rains the filth from above mentioned sources is washed into the stream in large quantities and gives to it a turbid aspect. A committee which examined the condition of the Seyon below Valangin and above the point from which the Neuchâtel water-supply is taken, immediately after a heavy rain, declared the stream to be "nothing but a vast drain, the water being absolutely unfit for alimentation." Some weeks prior to this outbreak at Neuchâtel, there had been cases of typhoid in nine of the small villages above Neuchâtel, and also about fifty cases of an infectious gastritis, thought by some to have been a mild typhoid. These cases were followed by a series of heavy rains, and these in turn by the typhoid outbreak at Neuchâtel. In the fall and early winter of 1873 after continued heavy rain there was an analogous outbreak of typhoid fever in Neuchâtel preceded some weeks by sporadic cases of the fever in the Val-de-Ruz. (L'Eau du Seyon et La Fievre Typhoide a Neuchâtel. Par Dr. Guillaume. Neuchâtel, 1882.)

#### NEUCHÂTEL R. R. STATION OUTBREAK.

Dr. Favarger relates (*Feuilles d'Hygiène*, November, 1879) that being called in the early part of 1873, as physician to the railroad company, to care for a series of more or less grave cases of typhoid fever (14 cases, 3 deaths), confined exclusively to the employees of the railroad station at Neuchâtel, he made an investigation and found that some weeks previous the son of an engineer in charge of the water-works had been taken with the fever, and had been cared for in the building which contained the hydraulic ram used for forcing water from the lake into a reservoir from which the station eating-house and the locomotives were supplied; he found that a portion of the excreta of this boy had passed into the lake near where the water-supply was taken and had undoubtedly been pumped into the reservoir, and then consumed by the employees of the station. —(Cited by Dr. Guillaume, as above.)

\* British Medical Journal, Sept. 6, 1884, page 456.

## BRANHAM SCHOOL OUTBREAK.

At the college of Branham, Yorkshire, Eng., two pupils were taken with typhoid fever in Feb., 1869, the discharges being thrown into the water closet. Toward the end of the next month there was, all at once, an outbreak of 16 cases of fever in the school. Investigation showed (1) that all the pupils ate the same food, while only a part were stricken; (2) that the beer drinkers were regularly spared by the disease; (3) that the disease seemed to single out the water-drinkers. These facts threw suspicion on the drinking water. Further investigation showed that a defective soil-pipe had allowed the typhoid excreta to pass from the water-closet into a reservoir of fresh water, and that the well water had been polluted by infiltrations from this reservoir. The fact that the food was cooked in this water would go to show that heat destroyed the typhoid poison.—(Dr. Anker, as quoted by Dr. Guillaume.)

## UPPINGHAM OUTBREAK.

During the month of Oct., 1875, fifty-one cases of typhoid fever occurred in a school at Uppingham, England. There had been one case of this fever (terminating fatally) in this school in the preceding June, and no sanitary precautions had been taken. The lad died at the commencement of the midsummer holidays. Two cases occurred between Sept. 21 and Sept. 28; and twenty-eight others between this date and Oct. 12, up to which time no sanitary precautions appear to have been taken. The excreta from these cases went into large, full, and extremely foul cess-pools in proximity to the wells,—afterwards shown to be polluted. The contents of some of these cess-pools was pumped upon the garden for fertilization purposes, and drained into a stream in the polluted water of which the boys were accustomed to bathe. The sewer-gas from these cess-pools, into which the typhoid excreta were thrown, penetrated almost without hindrance, not only the water-closets, but also the living and study rooms of the school. It will thus be seen that, whether the cause of the fever was gaseous or particulate, given a first case in this school there was *a priori* every reason to suppose the disease would spread as it afterwards did. This outbreak was carefully investigated by Dr. A. Haviland, Medical Officer of Health, who considered the outbreak to be the result of gross neglect on the part of the school authorities and the physician in charge.—(The Late Visitation of Typhoid Fever in the School and Town of Uppingham. London. E. & F. Spon, Publishers.)

## ARMLEY OUTBREAK.

In an epidemic of typhoid fever occurring at Armley, in the Borough of Leeds, England, which was investigated by Dr. Ballard, of the Local Government Board (Reports of the Med. Officer of the Privy Council and Local Gov't Board, New Series, No. II., London, 1875, Pg. 79-91), one hundred and seven cases occurred between July 7 and Sept. 7, 1873. The milk supplied by a certain dairyman, who had himself been ill of this disease in May, was shown to be the cause of the outbreak. "The manner in which the fever picked out the customers of the dairyman in various rows and blocks of houses, sparing other families, was indeed remarkable. \* \* \* As to the mechanism of the distribution of the fever from the dairyman's premises, there arises at the outset a question which it is desirable to answer, but to which, in the nature of things, a direct answer can hardly be expected. Was it water added to the milk that produced the enteric fever among families supplied from the dairy? No one knows anything of enteric fever being propagated by cow's milk *per se*, while there is very ample knowledge about the spread of such fever by means of water. The following considerations lead one to believe that it really was not through milk, but through water added to milk, that the customers of Hall Lane dairy got their infection of enteric fever. Houses occupied by families supplied from this dairy were invaded freshly, one after another, almost every day up to July 27; on that day three houses so occupied came freshly under medical notice; and from that day the epidemic, as such, was at an end. In the whole of the next week only one family dealing with the Hall Lane dairy applied newly for medical aid. This sudden cessation of the fever epidemic among this section of the community on July 27, means that the cause of the epidemic had ceased for them a fortnight or more previously, since in enteric fever there are commonly 11 days of incubation and several other days before medical advice for its symptoms is sought. July 10 would therefore be about the time when the cause of the epidemic among customers of the dairy suddenly ceased to operate. Now, on July 10, Dr. Robinson had the handle of the pump at the Hall Lane dairy chained up, and thenceforth it was kept chained. There was coincidence therefore between the cessation of the fever and the cessation of the opportunity that the dairy had to supply a particular water; while there was no suggestion that the cows or their milk had undergone any change." Did subsequent investigation of the water supply (in which the milk cans were known to have been washed) show it to be contaminated? Dr. Ballard leaves no doubt on this point. He says that the entire premises were in a filthy condition. Close to the well was an old urine tub in use; a very large dung pit full of filth and manure was situated about 15 feet from the well in one direction; and the privy used by three cottages (and full of liquid excrement) was only a little farther off in an opposite direction. This well was 36 feet deep, loosely



bricked up without cement for upper 22 feet, the lower 14 feet being in shale. "For the first four feet from the top of the well the outside of the brick work was puddled with clay, but not lower. All the way down below the place where the puddling ceased there was observed an oozing of black matter between the bricks, and below the spot where the brick work ceased the oozing was considerable, as shown by the staining of the stony portions of the soil, and by a black stain, 12 inches wide, on the side next the dung-pit, reaching to the water two feet lower down. There was a deposit of mud and filth at the bottom of the well which gave off abundant bubbles of gas on being disturbed." Analysis of the well-water showed much contamination from fecal matters. There had been considerable rain in the last part of May, toward the close of the dairyman's sickness.—The excreta had been thrown into the privy and also, in all probability, owing to the slovenly habits of the family, into the dung pit and the urine tub, which were very near the well.

#### LAUSANNE (SWITZERLAND) OUTBREAK.

"The case in which the poison of typhoid fever mixed with drinking water was transmitted through nearly a mile of porous earth, and which was mentioned in the abstract of my discourse to the Fellows of the Chemical Society (*Nature*, Vol. xlii, p. 331), is fully described (in German) in the 6th Report of the Rivers Commission on the Domestic Water Supply of Great Britain. It will shortly appear, in English, in the Monthly Journal of the Chemical Society. Meanwhile perhaps I may be allowed to trespass upon your space with the following remarks:—The outbreak of typhoid fever occurred at the village of Lausen, near Basel, Switzerland, and it was exhaustively investigated by Dr. A. Hagler of Basel, who has given a full account of it in the 'Deutsches Archiv. f. Klin. Med. xi.' The source of the poison was traced to an isolated farm house on the opposite side of a mountain ridge, where an imported case of typhoid, followed by two others, occurred shortly before the outbreak. A brook which ran past this house received the dejections of the patients, and their linen was washed in it. This brook was employed for the irrigation of some meadows near the farm house, and the effluent water filtered through the intervening mountain to a spring used in all the houses of Lausen, except six which were supplied with water from private wells. In these six houses no case of fever occurred, but scarcely one of the others escaped. No less than 130 people, or seventeen per cent of the whole population, were attacked, besides fourteen children, who received the infection whilst at home for their holidays and afterwards sickened on their return to school.

"The passage of water from the irrigated meadows to the spring at Lausen was proved by dissolving in it, at the meadows, 18 cwt. of common salt, and then observing the rapid increase of chlorine in the spring water; but the most important and interesting experiment consisted in mixing uniformly with the water 50 cwt. of flour, not a trace of which made its way to the spring, thus showing that the water was *filtered* through the intervening earth, and did not pass by an underground channel.

"These are the main features of the case, according to the works above cited. It affords a clear warning of the risk attending the use, for dietetic purposes, of water to which even so-called *purified* sewage gains access; notwithstanding that, as at Lausen, such water may have been used with impunity for years, until the moment when the sewage became infected with typhoid poison. E. FRANKLAND." Quoted from PUBLIC HEALTH, April 14, 1876, page 266.

#### SYRACUSE (N. Y.) OUTBREAK.

The history of this outbreak is very clearly set forth in an article on "Typhoid-Fever Poison," (*Popular Science Monthly*, N. Y., Feb. 1879,) by Dr. Eli Van de Warker. Sixteen cases of the fever were traced to one previous case, and the subsequent defilement by excreta from this case of one of the neighborhood wells by overflow of privy during a heavy rainstorm. People living on the same block or across the street, and under similar conditions except as to the water which they drank, escaped entirely, although many of these same people were up night and day caring for the afflicted families.

#### GERMAN TROOPS AT WITTENBERG.

In some respects one of the most interesting outbreaks of typhoid fever ever recorded occurred in the summer of 1832, among the troops of the third Brandenburg Infantry-Regiment, garrisoned at Wittenberg, Germany.

A full and admirable report of this outbreak by Staff Surgeon Dr. Gaffky, is given in the last volume of the Report of the Imperial German Board of Health (*Mittheilungen aus dem Kaiserlichen Gesundheitsamte*, Band II., Berlin, 1884), pages 403-420.

Between June 11 and July 12 there were ninety cases of the fever. This outbreak occurred very suddenly, and was confined almost exclusively to the troops of one battalion of the Regiment.—Citizens upon whom part of these soldiers were quartered escaped, as did also the officers. This sudden and severe epidemic at once attracted government attention, and the investigation which followed is very characteristic of the thorough way in which the Germans do things. Dr. Gaffky was detailed to make the investigation, with the approval of the Minister of War, and under the

direction of the Imperial Board of Health. By a rigid induction, every step of which is clearly detailed, Dr. Gaffky reached the conclusion that some weeks previous to the outbreak the well in the yard at the barracks had been infected by innumerable "typhoid seeds" from a neighboring privy, and that the use of the water of this well was the cause of the sickness. The citizens, officers, and soldiers not attacked escaped because they did not use the water of this well.

Two wells supplied the water used by the troops. Chemical analysis and careful inspection showed both wells to be badly contaminated, but in different ways. One well was situated in the yard of the barracks, near a privy. The water of this well was used for dish-washing, washing canteens, and scrubbing purposes, and to some extent for drinking purposes, but was not used for this purpose by the officers nor by many of the troops because the water was not so good as that brought from the street well. Into the privy typhoid excreta had unquestionably been thrown in the months immediately preceding this outbreak. The strata between this privy and the well were for the most part coarse sand and gravel, easily permeable. The privy vault had two openings in its walls and through these its liquid contents had oozed into the surrounding soil. Its subsequent movement into the ground-water and thence into the well was facilitated by three factors, (1) the lowness of the water in the well, (2) the increased amount of water which was drawn from the well at that season of the year, and (3) the movement of the ground-water itself which was found to flow from the privy toward the well.

The other well, much used by the citizens as well as by the troops on account of the better appearance and taste of the water, is located in the middle of the neighboring Burgomaster street. No cases of fever resulted from drinking the water of this well, although it was very foul. The manner of defilement of this well was as follows:—The horse-dung and other filth and rubbish of the street was supposed to be washed by rains along a pavement gutter to the northward away from this street well; but owing to a settling of the pavement there was a sag towards this well, and during rains the wash of the street actually poured into the well, and was pumped up and drank. This was not all,—beneath the pavement there was found a well-defined little gutter leading directly into the well. This befouling of the well had apparently occurred during every rain, for a long time, and yet no typhoid fever resulted from drinking this water, *because no typhoid germs had ever found their way into this well*. If typhoid dejections had at any time been cast into the street they would in all probability have been washed into the well during the next rainstorm. The author thinks there is no reasonable doubt that in such an event an epidemic such as was traced to the well in the yard at the barracks would also have resulted from drinking the water of the Burgomaster street well.

#### ADRIAN OUTBREAK.

In the fall and winter of 1883-4 an outbreak of typhoid fever occurred at Adrian, Michigan, in which there were fifty-three cases, with eight deaths. Over one-third the cases were pupils at a German Lutheran school in the house of the teacher, which house had for many years been used as a hotel, and at which was a well (in use by the family, the pupils, and others) very near which (from 25 to 56 feet) were an overflowing privy-vault, several old filled privy-vaults, two other privy-vaults in use, and a barnyard; there was also a drain or sewer (laid in June, 1883) in which, six feet from the well, was a leak from which the contents of the sewer flowed toward the well, forming a little cess-pool in the gravelly soil only 3 feet from the well-wall, which was of brick laid up without mortar,\* and from which cesspool the contents undoubtedly leached into the well. The well was 36 feet deep, with four feet of water at time of examination, October 24. Examination of the water with a microscope revealed vibriones and other organic matter, animal and vegetable. Analysis of the water showed sewage contamination. Twenty-one (of about eighty) pupils were sick, all of whom presumably drank of the water. Thirteen other persons who used water from the well were sick. Of the other nineteen cases eighteen were in the families of pupils or of persons who used the water and were sick, and but one was not traced thus directly or indirectly to this well, and he attended another German school in the neighborhood of this well.

The first case was a son of the teacher (about six years old), and was taken sick September 7. *Discharges from this patient were thrown into a catch-basin three feet from the well, connecting with the drain or sewer, and into which catch-basin passed the overflow from the pump.* Because of the leak above mentioned, if not otherwise, these typhoid discharges without doubt reached and infected the already foul water of the well. September 24, seventeen days after the first case was taken sick, the second case occurred. The third came down September 27, both in persons using water from this well. The fourth case attended a German school on a lot in the rear of the lot where the bad well was, and cornering with it, but it is stated did not use water from this well. He came down October 1. Cases from the fifth to the thirty-fourth, inclusive, came down from

\* According to another statement, the wall of the well had been relaid in water-lime in June before the sickness, at a time when it had been found necessary to have the well cleaned, the water having been reported as bad, pieces of dead earthworms having been brought up by the pump, at which time the drain or sewer was laid. Whether all or part of the wall was relaid in water-lime does not appear.

October 2 to October 22 as follows: Two, October 2; one, October 5; one, October 6; three, October 7; six, October 8; four, October 9; one, October 10; two, October 11; one, October 11; one, October 15; one, October 16; two, October 17; one each, October 19, 20, 21, and 22; and one at a date not so definitely ascertained. Of these 30 cases 20 were pupils of the school, 9 were other persons who used water from this well, and one (a brother of one of the pupils taken sick Oct. 9) was a pupil at a third German school, across the street and about 12 rods from the one where the bad well was, and was himself taken sick Oct. 9, but is said not to have drank from the bad well.

The physician who treated the first and third cases was called to the third (his second) October 4, which day, at his request, the use of the water from this well was discontinued; but before the use of the water was discontinued the 30 persons (pupils and others who used the water) who were taken sick from October 2 to October 22 had an opportunity to become infected from this water.

After October 22 there were no more new cases till November 5th; then began a second series of 19 cases, all but two of them in the families (mostly in two families) of previous cases, which 19 cases were taken sick at dates as follows: One each, November 5, 7, 8, 13, 19, 21, 24, 27, 28, December 1, 4, 13, 15, 19, 25, January 1 (1881), 4, 7, and April 1. Of these, 8 were in one family (and its near and neighboring relatives), the first case in which was one of the pupils taken sick October 7, the second case being taken sick November 24; and four were in a family, the first case in which was the pupil taken sick October 15, and the second case was taken December 1; two (taken Nov. 13 and Nov. 21) were in a family in which two cases (one of them a pupil at the bad well) were taken sick Oct. 9; three were in three families in which had been sick pupils, taken sick October 8, October 9, and October 8, and in which the second cases were Nov. 8, Nov. 5, and Nov. 19, respectively; one of the other two was a near neighbor of a family in which were five cases; and one attended the German school across the street from the bad well and drank from that well. Two of the second series of cases were users of water from the bad well, one of them being a pupil at the school where that well was. Concerning these it does not appear whether they used the water after it was infected by discharges from the first case (taken Sept. 7). The interval is so great between the discontinuance of the water (Oct. 4) and the coming down of these two cases (Nov. 7 and Nov. 19) as to make it seem likely that they were infected in some other way than by water drank before Oct. 4. Concerning the two cases in the first series who are stated not to have used water from the bad well, it should be remembered that they attended schools near that well, one of them had a sister attending the school where the bad well was, and it does not seem unlikely that they may have visited the playground and drank at the bad well, as one pupil of the school across the street from the bad well is stated to have drank at that well.

Where and how the first case in this outbreak contracted the fever is not known, but typhoid fever is known to have occurred in a house near the school the year previous to this outbreak.

A longer report of this outbreak (not, however, including all the cases) is printed on pages 36-47 of the Report of the State Board of Health for 1884.

It appears to be established conclusively that in this outbreak the fever resulted from the use of foul well-water, *after it had become infected by the specific discharges from a first case*. The facts developed may be summarized as follows:

1. Filth conditions likely to contaminate this well (the nearness of the privy-vaults and the barn-yard) had existed for a long time without, so far as known, causing a case of typhoid fever. It had been found necessary to clean the well in June before the sickness. The leaky drain laid in June became another source of contamination. Unless M. H. (the teacher's son) was infected with the foul water, no case of typhoid fever resulted from the use of the foul water until excreta (containing the specific typhoid germs?) from a case (M. H., the first case) of typhoid fever were introduced into the water. Then, after about the usual period of incubation, other cases followed rapidly. If the teacher's son, M. H., was infected by water from the well, it seems strange that of the large number of persons using water from this well, no one else should have been infected at that time, and that no other case occurred till 17 days after the first, especially as so many of those subsequently infected by the water were near the age of this first case, about six years.

2. After the first case of the fever occurred (September 7), seventeen days elapsed before the second case (September 24). This may indicate that the period of incubation was, in that case, 17 days; or if we call the period of incubation 11 days, it was six days after the first case was taken sick before his discharges were capable of causing the disease; or it took six days for the discharges to reach and so infect the body of water in this well as that it could cause typhoid fever. The third case occurred September 27, and the other cases followed rapidly (thirteen of them coming down on the three days, Oct. 7, 8, and 9) until October 22.

3. The use of the well-water ceased about October 4.

4. In the first series, new cases ceased to appear about 18 days after the use of the water from the condemned well was discontinued.

5. In the first series of cases, out of about 80 members of this school 20 had the fever, and all of these are believed to have used water from the infected well.

6. In this series, fourteen other persons, not members of the school, had the fever. All but two



of these used the water of this well, occasionally or habitually; one of the two was a brother of one of the sick pupils.

7. The first series of 34 cases, with possibly one exception, *was confined to persons using the water from this infected well.*

8. The second series of 19 cases, beginning Nov. 5 and ending April 1, could not have been derived directly from the school well (a) because but two of these persons used its water, and (b) because the first case of this second series occurred Nov. 5, 32 days after the use of the well water was discontinued.

9. Most of these 19 persons *might have contracted the fever from the infection of their own wells or drinking water* (a) because this second series of cases all occurred in families whose children or near neighbors had contracted the fever at the school and had been nursed at home, and (b) because nearly all this second series of cases occurred in from 3 to 6 weeks after the first case in the family, and sufficient time after the first case in the family to allow for the infection of the home privy-vaults and the subsequent infiltration of this infection through the porous soil into the wells, which infection of the water-supply may have been continued by subsequent cases in the same family.

An outbreak at Caterham, England, and a few other outbreaks are mentioned on page 108.

TABLE 4.—*Inches of Earth above Ground water, from Observations of Wells in Michigan, by Months for the Five Years, and for each of the Five Years 1878-82, also for 1883.*

YEARS. NUMBER OF WELLS.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 years, 1878-82...	159	139	137	131	132	139	162	171	173	176	164	157
1878, at Elsie .....	96	96	84	90	90	96	102	120	132	138	120	103
1879, at Otisville.....	-----	60	55	42	57	68	87	91	76	71	71	52
1880, Av. at 4 stations*	231	231	230	222	226	234	244	261	263	260	253	244
1881, Av. at 3 stations†	200	201	212	194	170	162	198	232	255	249	222	215
1882, Av. at 3 stations‡	108	106	104	108	116	136	180	152	140	160	156	168
1883, Av. at 2 stations	132	132	84	48	45	45	96	108	129	120	108	111

NOTE.—As the stations are different for different years, this table is useful rather for comparing months in the same year with each other than for comparing one year with another. The average line in Table 4 is represented in Diagram A, page 94; the lines for 1878 and 1879, in Diagram B, page 96.

\* In 1880, at Thornville, Hillsdale, Mendon, and Union City. (Diagram B, page 96.)

† In 1881, at Thornville, Linden, and Dearborn. (Diagram B, page 96.)

‡ In 1882, at Brockway Center, Otisville, and Woodland. (Diagram C, page 97.)

|| In 1883, at Brockway Center and Saginaw City. (Diagram C, page 97.)

IS THE CONSTITUENT OF THE DRINKING WATER THAT CAUSES TYPHOID FEVER, SPECIFIC? MAY THE DISEASE BE CAUSED BY MORE THAN ONE SPECIES OF BACTERIA? BY THE ORDINARY BACTERIA OF DECOMPOSITION?

The statistics show that in Michigan, typhoid fever in every year increases in prevalence in the autumn months, following the season of the year when there is most sickness from diarrhea. With the unusual prevalence of typhoid fever in Michigan in 1881, beginning in July of that year, we must note the unusual prevalence of *diarrhea* in that year, especially in June, July, and October. (There was most sickness from diarrhea in August, but compared with other years, the sickness in June, July, and October was very unusual). Then again, in the year 1882, the greatest prevalence of typhoid fever occurred rather later in the season than usual, as did also the diarrhea, and as did also the highest monthly average temperature in that year. Whether the typhoid fever is very generally caused by diarrheal discharges getting into the drinking water, and whether the diarrhea is sometimes caused by bad water under conditions the same as, or similar to those which cause the typhoid fever, are among the many interesting questions in this connection upon which further evidence is desirable.

With reference to the causation of typhoid fever by air and water contaminated with diarrheal discharges, we are indebted to Dr. W. Stewart, Honorary Surgeon to Beckett Hospital, Barnsley, for facts and suggestions as to how the fever may thus arise.\* Speaking of a series of cases of typhoid fever, Dr. Stewart says:—

"After careful inquiry, I arrived at the conclusion that the cause of this outbreak was to be attributed to the fact that the slaughter-house of a butcher was situated at the end of the row, into the common sewer of which the blood from his operations was allowed to flow, there to remain and putrefy. The waste pipes from the sinks were directly connected with this drain without the intervention of any kind of trap, and the smell therefrom was often horrible. Here the putrefaction of a highly albuminous liquid, blood, in the drain, and a direct communication between it and the interior of the cottages, seemed to give rise to the fever." Dr. Stewart gives other cases, and then says: "In the experiments instituted by M. V. Feltz, and communicated to the *Académie des Sciences*, upon the effect produced upon dogs by the injection of putrid blood, and alluded to in a contemporary (*Lancet*, Vol. II, 1875, p. 460), the symptoms produced were very analogous to those we see in typhoid fever.

"Putrid blood which has stood for several months was dried and desiccated in the air-bath and mixed with a certain quantity of distilled water, and injected into the crural vein of three powerful dogs. The animals immediately exhibited marked depression. After a period of incubation of from four to five days, febrile symptoms set in, accompanied by vomiting, loss of appetite, elevation of temperature, bilious and bloody diarrhea, and biliary urine; and these symptoms were produced even when all trace of bacterial life had disappeared from the blood injected." After referring to the typhoid condition in puerperal fever, attributed to decomposing blood, and referring to other considerations, he says:—"The question may now be asked in what way is the origin of these cases, apparently arising from some component of putrefying blood, connected with the vast number of typhoid fever cases which appear to arise from the pollution of drinking-water by the excrement of human beings? In this manner, by fixing upon the serum of the blood as the essential factor of the poison, we at once see how any severe case of diarrhea would be sufficient to produce the disease, because the liquid evacuation of severe diarrhea is principally composed of serum blood, and it is drawn from a source and placed in a condition highly favorable to the development of the putrefactive process. \* \* \* This theory of typhoid fever, arising from the decomposition of the serous evacuations of severe diarrhea, accounts in a more satisfactory manner than any other for the extraordinary prevalence of the fever at a certain period of the year. It is a fact of universal observation that enteric-fever cases reach their maximum, in point of numbers, in the months of October, November, and December; and this 'periodical disposition' to the disease is accounted for by Liebermeister (who believes that 'the real cause of every epidemic and every isolated case of typhoid fever is only the specific poison of typhoid fever' (*Ziemssen's Cyclopædia*, Vol. I, p. 61), in the following manner. He says (*ibid*, Vol. I, p. 65): 'The curves representing the frequency of typhoid correspond to the curves of average temperature, only with this difference—the different points of the typhoid curve follow those of the temperature curve by an interval of some months; and in order to account for this discrepancy, he says it takes two or three months for the changes of temperature to penetrate to the breeding places of the typhoid germs.' But, if it can be shown that typhoid fever may arise from the putrefactive decomposition of blood-serum, then the abundant prevalence of summer cholera, from the end of July to the beginning of September, affords plenty of material for the elaboration of the poison, which afterwards percolates into the wells or is washed by the autumnal rains into the sources of our water-supply." Dr. Stewart says: "I do not propose to enter into the discussion as to whether the disease can have an abio-genetic origin, although the facts upon which my theory is founded appear to favor that doctrine. Whether the fever arises only from specific typhoid germs, which (according to the advocates of this theory) have a nearly omnipresent existence, and have the property of preserving their vitality in a dormant condition for many years, ready to spring into active and vigorous life when introduced into a proper nidus for their development; or whether the poison is manufactured from the ordinary germs existing in all the putrefactive processes which take place in certain animal fluids, or is elaborated by some subtle chemical change in the properties of the substance itself, does not signify so much to those who have to deal practically with the disease, so long as we can put our finger upon the factor, element, or pabulum without which these forces would be rendered permanently impotent. It is from the conviction that this pabulum will be found in albuminous liquids, such as blood, blood-serum, and the liquid discharges from the bowels in diarrhea, and that the poison of typhoid fever is elaborated from the putrefactive changes which occur in them after their expulsion from the body and subsequent exposure to the air, that I have ventured to draw the attention of the profession to what appears to me to be a probable explanation of the origin of this disease."

\* *British Med. Jour.*, reprinted in "Public Health," March 16, 1877, pp. 192-193.

I agree with Dr. Stewart that a great practical point is gained when we know the materials and places in which the cause of typhoid fever is reproduced; but we also need to know in what way the cause of typhoid fever usually enters the body,—whether, as he seems to think it sometimes does, with the air which is breathed, or whether it is generally with the water which is drank; and I still think the question whether or not the disease is specific is an important one to which we should seek the true answer. From the evidences of statistics, from clinical evidence, and such evidence as to coincident conditions as those relative to well-water, etc., it may not be quite possible to decide whether the cause of typhoid fever is or is not specific; because, although we can say that the cause is associated with decomposing organic matter, of vegetable and animal origin, in drinking-water, and that it appears to be capable of reproduction, thereby making it extremely probable that the cause is organic, and probably one or more of the bacteria,—many of such organisms are known to be able to reproduce themselves in meat juice, and other fluids consisting of water and *animal* products, also in *vegetable* infusions, and even in *mineral* solutions, not directly derived either from animals or vegetables, as for instance in Pasteur's solution. Yet it is probable that by proper effort we may soon learn the truth,—whether typhoid fever is ever caused by more than one species of bacteria, whether the cause of every case is derived from a previous case.

Bearing upon the question of a specific cause for typhoid fever, are many well-known outbreaks, especially those at Caterham and Red Hill, England; at Lausanne, Switzerland\*; and Dr. Austin Flint's cases at New Boston, N. Y. The history of the outbreaks at Caterham and Red Hill is substantially as follows†: In the towns of Caterham and Red Hill, England, 352 cases and 21 deaths from typhoid fever occurred in a period of six weeks in 1879. Dr. Thorne Thorne, of the Local Government Board, made a thorough investigation, and found that the cause of the outbreak could be very clearly traced to the defilement of the common water-supply of the two towns by the typhoid excreta of a workman employed at the water-works in the construction of an adit from an old well to a new bore which was being sunk. This man worked at the bottom of the adit, 455 feet below the surface, and was at the time suffering from a mild form of typhoid fever. The excreta of this man was hauled up to the surface in a bucket, and spattered over on the sides and the bottom of the adit, into which the water-supply was soon after admitted. The outbreaks occurred about two weeks after the infection of the water, and were confined entirely to those families using water from the pipe lines. The cases at Lausanne, stated on page 103, also strongly indicate that the cause of typhoid fever is specific; and the cases recorded by Dr. Austin Flint can hardly be explained on any other hypothesis; nor can the cases reported by Dr. Gaffky. See, in this article, "German Troops at Wittenberg," page 103. The Adrian, (Mich.) outbreak, a synopsis of which appears on page 104, in this article, also supplies strong evidence that the disease was spread by the discharges from a first case infecting the drinking water.

Klein, (†) Klebs, (||) and many other eminent histologists have thought that typhoid fever is caused by a specific bacterium, although they have not agreed as to which of several described forms should be considered the *true typhoid bacterium*. A recent view is that the forms seen by Klein and Klebs in the

\* Detailed on page 103.

† Ninth Annual Report of the Local Government Board, 1879-80, pages 78-92.

‡ Intimate Anatomical Change in Typhoid Fever: *Reports of the Medical Officer of the Privy Council and Local Gov't. Board*. London. 1875. Also, *Public Health*, June 16, 1876, page 463.

|| Archiv für exper. Pathologie, 1881.



diseased Peyer's glands are secondary invasions, and that the real cause of the disease is a peculiar short, thick bacillus with rounded ends, found during the fever not only in the diseased Peyer's patches but also in various other organs of the body, as the liver, spleen, and kidneys. This bacillus has been described by Eberth, Meyer, and Friedländer, and is believed by them to be specific. Koch has confirmed the statements made by these observers, and Ziegler says this bacillus is "probably the exciting cause of the disease."\* The statements of Eberth, Meyer, and Friedländer have been again confirmed quite recently† by a series of very exhaustive and carefully conducted microscopic examinations by Dr. Gaffky, of the Imperial German Board of Health. These bacilli have been found by him in 27 out of 28 cadavers examined, and have never been found, either by himself or by the other investigators named, except in typhoid cases. It is believed that the failure to find this bacillus in the twenty-eighth cadaver was because death had occurred at a late stage of the disease, when the characteristic symptoms of the disease had mostly disappeared, and at which stage of the fever this bacillus is much less frequent than at an earlier stage. Dr. Gaffky cultivated this typhoid bacillus outside of the body on various nutritive substances, as nutrient gelatin, meat-broth, fluid blood-serum, boiled potatoes, and also in *vegetable solutions*, although in the latter they grew less vigorously. All Dr. Gaffky's attempts to reproduce the disease in the lower animals proved futile, but inoculations of animals with cultures of typhoid bacteria are recently reported‡ to have been successfully made by two French scientists, MM. Tayon and Mozioconacci. The description of their experiments, however, leaves much to be desired by way of explanation and confirmation.

#### HOW IS TYPHOID FEVER INDUCED BY LOW WATER IN WELLS?

The evidence of the causation of typhoid fever by low water in wells will not be accepted by some persons, because they do not understand, at first sight, how the disease can be thus caused. Several persons to whom I have presented some of this evidence have replied that they could understand how dilution of a *poison* would lessen its effects; but that if typhoid fever is caused by a specific organism, they failed to see how the low water in wells could cause the disease. A study of the relations of privies to wells, and the statement of certain facts may aid such persons to an understanding of how it is possible to explain such mode of causation.

Herewith I submit a diagram, page 110, showing a privy and a well under two circumstances; in one case the water in the well is low, and in the other case it is high. It would seem that when the level of the water is the same in the well as in the privy, there would not be likely to be a mingling of the water from the privy with that in the well, unless the distance between them was small. But whenever and wherever the water in the well is below the bottom of the privy not far distant, there will be a strong tendency of the fluids cast in the privy to pass downward toward the water in the well; or, if not directly to the well, to the ground-water not far distant, which will pass into the well to replace that which is drawn. The quantities of solid and liquid filth deposited in privies probably do not vary much from month to month, except that because of diarrhea in the hot months of July and August, more

\* Pathological Anatomy. London, 1883, Part I, page 300.

† Zur Ätiologie des Abdominal typhus; *Mittheilungen aus dem Kaiserlichen Gesundheitsamte*. Band II., 1884, pages 372-403.

‡ *Comptes Rendus*, Aug. 18, 1884, vol. xcix., pages 331-334.

fluid fecal matter probably enters them. The supposed causation of the regularly recurring increase of typhoid fever in the autumn, by discharges from persons suffering from diarrhea gaining access to the drinking water, is referred to in another part of this paper. That is only one way of rendering the water foul, or, as we might say, nutritive to bacteria; and it is quite in keeping with the other evidence referred to in this paper, as to outbreaks of typhoid fever after the use of water contaminated by decomposing animal and vege-

DIAGRAM D.—*Illustrating the Proposition that the Fluids Cast into a Privy bear a Relation to the Water in a Well Not Far Distant, which Relation is Different When the Water in the Well is High from What it is When the Water is Low.*

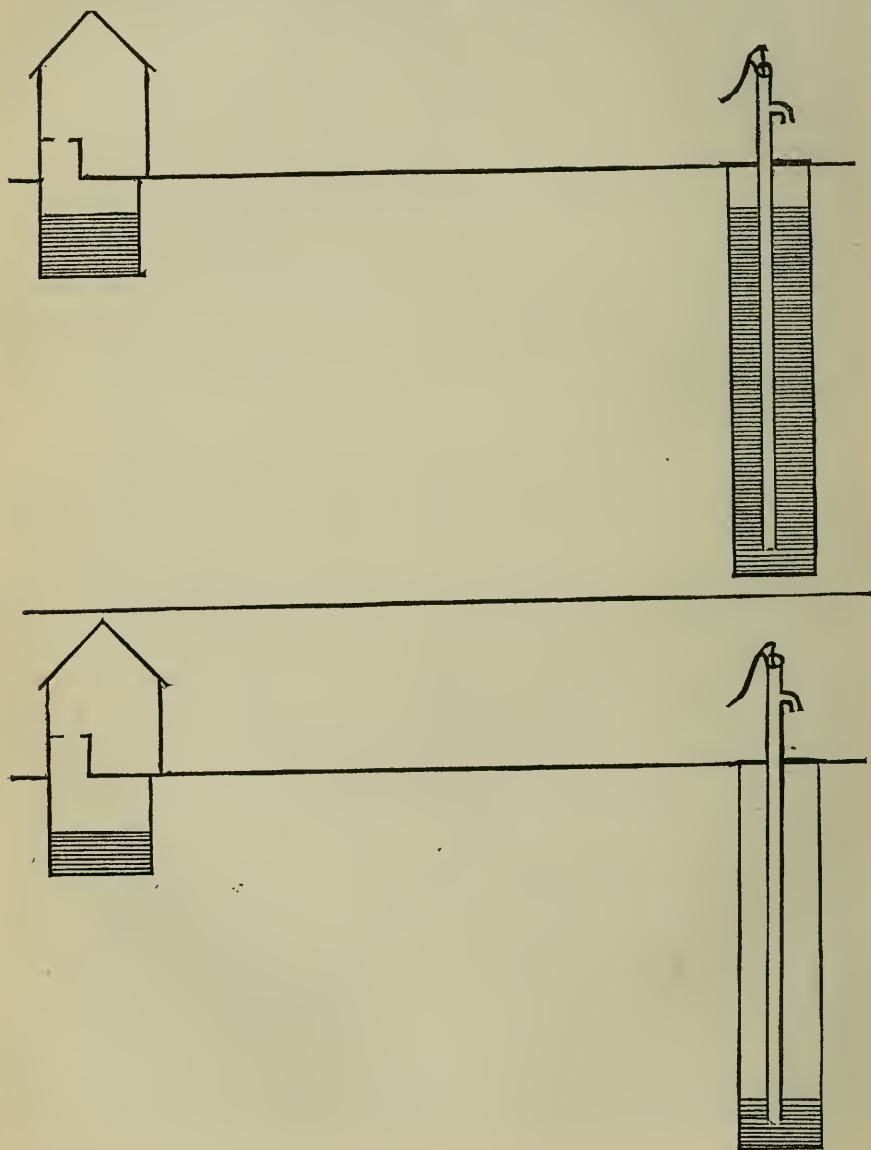


table matter. The explanation of all these lines of evidence would seem to be that either the ordinary bacteria of decomposition cause typhoid fever, or that the specific cause of the disease is quite generally distributed, *and is capable of self-multiplication outside of the body*, whenever it falls into fluids sufficiently nutritive. But even if the cause of the autumnal increase of typhoid fever is the diarrhea which precedes it, and which is itself caused directly or indirectly by the high temperature,—even then, it would seem that under present circumstances the quantities of water in wells controls the rise and fall of typhoid fever; because the relation which the curve representing diarrhea bears to the curve representing the fever is not closer than is that borne by the curve representing water in wells; and it is probable that it is only by passing into the drinking water that the diarrheal discharges help to cause typhoid fever.

In the early autumn, also, there is more than the usual likelihood of a *specific cause* being introduced into certain wells, because then surface supplies of drinking-water, wash-water, etc., are diminished to such an extent that unusually large drafts are made on the wells. This increased use of well-water would lead to the drainage of an unusually large territory around the wells, with a consequently increased danger of contamination from privies infected by typhoid excreta.

I think we may now safely assume that there is a greater dilution of the dejections from typhoid-fever patients, and of human excreta generally, when the water in wells is high than when it is low, except when the low water is caused by a frozen ground which locks up the excreta on the surface of the earth. It cannot yet be positively asserted that the specific cause of typhoid fever is reproduced outside of the body in nutritive solutions at the temperature of water in wells; yet this may be found to be possible, or, if not in wells, in the higher temperature of privy-pits, from which they may pass into the well, either at once in the form of mature bacilli, or after a time in the less perishable form of spores; and if typhoid fever is caused by the ordinary bacteria of decomposition, as many seem to believe, then we must consider that lessening the quantity of water in wells would probably (except as just mentioned) lessen the dilution of the fluid derived from privies, and consequently increase the proportion of bacteria thus introduced into a given quantity of well water; and not only this, but the proportion of albuminoid matter suitable for the rapid reproduction of bacteria would then be increased; and, bearing in mind how rapidly the reproduction of bacteria occurs under such circumstances, we can well understand how in such a "culture fluid" there would soon be something of very much greater import than simply what would result from a lack of dilution of a fluid containing some organism or poison not capable of self-multiplication. Then, again, the ordinary bacteria are known to be frequently in much greater abundance on the surface than elsewhere in a liquid, because of their requirement of air; therefore a much greater proportion of bacteria would be likely to be drawn up by a pump reaching to the bottom of a well, when the top of the water falls to near the opening into the pump.

Many years since Chauveau\* performed a series of careful experiments with vaccine virus diluted with constantly increasing quantities of water, when he found that the proportion of successful vaccinations was correspondingly decreased. Under these circumstances it appeared that whenever there was a lodgement of the virus the development of the case proceeded regularly to the

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\* Comptes Rendus, lxxviii, 1868, and lxxii, 1871.



close; but with large quantities of water the proportion of such cases of successful vaccination was very small. I suppose that no one now doubts that vaccinia is caused by specific particles which are reproduced within the body (it is now many years since vaccinia was shown to be due to a "particulate" cause, and those same experiments by Chauveau had much to do with establishing that fact; however, Dr. Burdon-Sanderson's experiments verified those made by Chauveau, and have been considered sufficient to establish this point). The two points just alluded to (the lessened chance of vaccination with diluted virus, and the fact that vaccinia is a specific disease) may serve to remind those who have not held these facts in mind, that *dilution of a fluid containing the specific cause of a disease lessens the chances of communicating that disease* when the fluid is brought in contact with the body.

An objection has been offered, that the variations in the amounts of water in wells, as shown by the diagrams, were too slight to account for so great differences in the prevalence of typhoid fever as are shown to occur in Michigan in the months of June and October. The reply is that the variations shown in the diagrams are mostly averages of several wells, and that in one of the wells included in the average for the year 1881, the amount of the variation was from twenty feet of water in the month of June, to no water whatever, in the month of September. Besides this, the wells measured are not the wells the water of which actually caused the typhoid fever in Michigan, but they are only examples of how the water rose and fell, on the average; it is probable that many wells (besides one of those observed) were nearly dry at some period during or following the extreme drouth of 1881.

An instructive inference from the evidence which I present is either that the cause of typhoid fever does not long remain in the well-water in an active form, or that the dilution is so great as to reduce very greatly the chances of its producing the disease. As the water lowers in summer, the typhoid fever cause is apparently quick to act; and as soon as the autumnal rains filter into the wells, its action quickly disappears, although it must be admitted that at no time of the year is the State entirely free from typhoid fever; and it is quite possible that the rapid subsidence of typhoid fever after the autumn rains is simply because of the extreme dilution of its cause in the wells.

#### THE CAUSE OF THE GENERAL ANTAGONISM BETWEEN INTERMITTENT FEVER AND TYPHOID FEVER.

It would lead us too far aside to treat fully here of the controlling cause of intermittent fever; but it may be allowable for me to say here that we now have possession of facts which in my opinion enable us to explain the general antagonism between intermittent fever and typhoid fever; and that the nature of some of these facts may easily be inferred; because *high* ground-water, with coincident high temperature of the air, is generally conducive to intermittent fever; and *low* ground-water is conducive to typhoid fever, whenever the drinking-water is liable to be contaminated by typhoid excreta. The first-named condition is most frequently found in new countries, as yet undrained; the last named in localities which have long been settled,—especially in large villages which depend upon wells for their water-supply.

#### WHAT NEED IS THERE FOR THE PREVENTION OF TYPHOID FEVER IN MICHIGAN?

For the five years, 1878 to 1882 inclusive, there were returned as having occurred in Michigan, 2,586 deaths from typhoid fever (Page 92.) This is

an average of 517 each year; but we have reason to believe that the deaths returned are about one-half of the number that occur; therefore we conclude that, on the average, over one thousand persons die in Michigan in each year from typhoid fever. The proportion is not greater in Michigan than in other States.\*

#### HOW CAN TYPHOID FEVER BE PREVENTED?

If the evidence which I have presented is conclusive, the reply to the above question may be stated in four words, namely: *Stop drinking contaminated water.* This might not prevent *all* the typhoid fever; but it would appear that by far the greater proportion of it in Michigan may reasonably be expected to be thus preventable. How to prevent the contamination of the various water-supplies, cannot be so briefly stated; but if people care enough about it to take the necessary trouble to do this, sanitarians can tell them how. So far as it relates to typhoid fever, it *may* be that all that is necessary is to destroy and keep out of the water all discharges from persons suffering from typhoid fever; but the difficulty of recognizing the disease early enough in its course is so great, that in order to do this it will be necessary to keep all human excreta, and perhaps the excreta of some animals, out of the water-supply. Most people think they do this now, or probably we would not have a thousand deaths a year in one State from this cause; but I think we have reason to believe that their confidence in the purity of the water they drink is misplaced, and that consequently many of them sicken and die. The numerous instances where typhoid fever has apparently been caused by drinking-water contaminated by decomposing *vegetable* matter, indicate that, even if the cause of the disease is specific, until such time as that the specific cause shall be so restricted as not to find access to water-supplies, it is important to preserve the water from contamination by vegetable as well as by animal matter.

HENRY B. BAKER.

NOTE.—In this paper the design has been to present one line of the evidence on this subject which, during the past ten years, has been collecting in the Annual Reports of the Michigan State Board of Health, in the office and library of the Board, and in the mind and manuscript of the writer; and in doing so, much of the interesting evidence which has been contributed by prominent physicians and others in Michigan, on the general subject of the causation of typhoid fever by contaminated water, has been omitted, in order to confine the paper mainly to the subject of the relation of low water in wells from which water is drank to the causation of typhoid fever. But, although in this paper no attempt is made to give the literature of the general subject of the relation of ground water to typhoid fever, the author cannot let the paper go without a reference to the work of one whose name is foremost throughout the world in connection with this general subject. I refer to Max von Pettenkofer, of Munich. If I understand Pettenkofer's view, it was in 1869, that with the recession of the ground water the air enters deeper into the soil, and stimulates into activity and multiplication disease germs which lay dormant when under water. These germs permeate this *ground air*, and whenever the barometric pressure is low, or other conditions favor its

\*There is reason to suppose that a large number of deaths attributed to other diseases than typhoid fever are caused by impure drinking-water. In a paper entitled: "Chronic Zymotic Disease Simulating Consumption," in the Annual Report of the New Hampshire State Board of Health for 1884, page 240, D. M. Currier, M. D., says: "Another instance in point where the effect lay between typhoid fever and consumption, with a decided preponderance in favor of the latter, and caused by drinking impure well-water, was reported and published in the report of the State Board of Health [N. H.] for 1883, in which the analysis of the water is given (pp. 263-269) [The water was very foul, and was declared 'neither fit for man nor beast.'] On this farm nine persons died, — two of typhoid fever, one of gall stones, and six of consumption, the last of which was the only one that I had under personal observation. A general survey of the case would give one the impression that he was suffering from tubercular deposit in the lungs, but upon thorough examination of the chest no evidence of tubercles could be found. There was equal resonance over both lungs, which were equally and fully distended by a forced inspiration. He had chronic laryngopharyngitis, with loss of voice. There was great and constant irritation of the stomach, as manifested by frequent nausea and vomiting of food, with progressive weakness and low vitality. This went on, and the man died, not, in my opinion, from tubercular consumption, but from what I believe to be chronic poisoning by the filthy water he drank."

upward movement, the germ-laden air rises from the soil, and enters houses, and causes typhoid fever. That there is a causal relation of low ground-water (not necessarily in wells, but underlying residences) Pettenkofer, from the great masses of statistics with which he dealt, long ago considered established, the chances being as 36,000 to 1. (Boden und Grundwasser, etc., Pettenkofer, Munich, 1869, pages 16 and 137.)

The interpretation of the most usual mode of entrance of the cause of typhoid fever into the human body, which pervades this paper, is very different from the interpretation which Prof. Pettenkofer seems to have adopted; yet, so far as relates to the fact of there being a relation of water in wells (ground-water) to typhoid fever, the evidence relative to Michigan is not materially different from the evidence relative to Munich, with which Prof. Pettenkofer dealt; except that it has been found that in Michigan a frozen surface of the ground prevents the low water from causing typhoid fever. Whether or not the interpretation which the author of this paper adopts—that the cause of the fever enters the body most frequently with the drinking water—will apply to the causation of typhoid fever in Munich at the time the subject was studied by Prof. Pettenkofer, the writer has no ready means of determining, not having at hand a reliable account of the water-supply of Munich during that period of time—1856 to 1869. But in this connection an account of the enormous reduction of typhoid fever in Munich coincidently with the construction of sewers, is interesting and suggestive. In an extract from an address by Capt. Douglas Galton, quoted from "Proposed Plan for a Sewerage System, etc.," by Samuel M. Gray, C. E., Providence, R. I., 1884, pages 7-8, it is stated that "at Munich the enteric [typhoid] fever mortality *per* 1,000,000 of inhabitants for quinquennial periods, was as under:—

"1854 to 1859, when there were absolutely no regulations for keeping the soil clean .....	24.2
"1860 to 1865, when reforms were begun by cementing the sides and bottoms of porous cess-pits .....	16.8
"1866 to 1873, when there was partial sewerage .....	13.3
"1876 to 1880, when the sewerage was complete .....	8.7"

There was thus, in Munich, coincident with sanitary work, a reduction of two-thirds of the mortality from one of the most deadly diseases. Whether this great reduction was due entirely to the work for complete sewerage, or whether that work was wholly or in part incidental, I am not now able to say; but it is reasonable to infer that during the years 1856 to 1869 when Buhl, Seidel, Pettenkofer, and others were collecting their evidence relative to ground water and typhoid fever, and when, as appears from what I have just quoted, there was little or no sewerage in Munich, there may not have been as good water supply as there was after the sewers were complete. If the water supply was in great part from wells, the evidence which Pettenkofer compiled, together with his statement of probabilities of 36,000 to 1, of the relation of low ground water to typhoid fever being a causal relation, holds as well in favor of the view that the mode of introduction into the body was with the drinking water as in favor of the view that its introduction was with the air inhaled.

At the meeting of the American Medical Association in Detroit in June, 1874, during a discussion in the Public Health section, Dr. Foster Pratt of Kalamazoo, Michigan, remarked that typhoid fever became unusually prevalent in Kalamazoo in a certain year, in the autumn about the time the water in the wells became very low, some wells being dry. Dr. Pratt's remarks at that time have had much influence toward the collection, during the past ten years, of facts bearing upon this subject, and toward the preparation of this paper.

H. B. B.



## REGISTRATION OF PHYSICIANS IN MICHIGAN.

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REPORT BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

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*To the President and Members of the Michigan State Board of Health :*

GENTLEMEN :—Act No. 167, laws of 1883, requires all practitioners of medicine or surgery, or of any branch thereof, including midwifery, but excepting dentistry\*, in Michigan to file with the county clerk of the county wherein he has been engaged in practice, or in which he intends to practice, a sworn statement setting forth the length of time he has been engaged in continuous practice in said county, and if a graduate of a medical college, the name of the same and where located, when he graduated, and the length of time he attended the same, also the school of medicine to which he belongs; and if he is a student or undergraduate, the length of time he has been engaged in the study of medicine and where, and if he has attended a medical college, the name of the same and where located, and the length of time so attended and when, also the name and residence of the physician under whose instruction he is practicing or intends to practice. County clerks are required to record these statements in a book.

The act disqualifies practitioners from collecting in court pay for professional services rendered before they registered and after the act went into effect, September 7, 1883. The act requires the further qualification that the practitioner either shall have practiced medicine continuously for five years in this State and shall be in practice when the act took effect, or shall be a graduate of a legally authorized medical college in the United States or in some other country, except that registered students or undergraduates may practice with and under the instruction of a legally qualified practitioner. It is made a misdemeanor punishable by a fine of not less than five nor more than fifty dollars for any person to advertise or hold himself out to the public as authorized to practice medicine or surgery when in fact he is not so authorized under the provisions of this act. The act gave practitioners three months, or till December 7, in which to register in compliance with its requirements.

Numerous inquiries were received at this office as to the construction of the act. In order to be able better to answer these, a letter was addressed to the Attorney General asking whether registration in one county qualifies a physician to practice anywhere in the State, or whether he must register in every county in which he practices, and whether a physician who moved into the State, or who graduated, after the expiration of the three months from date when the law went into effect (within which three months physicians were required to register), or who for any reason had not registered within that

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\* Provision for regulation of the practice of dentistry is made by act No. 140, laws of 1883.

time, becomes a legally qualified practitioner, within the meaning of this act, by filing with the county clerk the sworn statement required by the act. In reply, the following communication was received from the Attorney General:

STATE OF MICHIGAN,  
Attorney General's Office, Lansing, Jan. 9, 1884. }

Henry B. Baker, M. D., Secretary State Board of Health :

DEAR SIR:—Yours relative to the proper construction of act 167, laws 1883, entitled "An act to promote public health," and inquiring whether physicians could lawfully register after the time fixed by statute for the registration of physicians, is at hand, and in reply would say, that physician, *can lawfully register at any time.*

The act, after declaring the necessary qualifications for the practice of medicine in this State required that persons so qualified should, within three months after the law took effect, file with the county clerk the statement therein set forth.

The three months after the law took effect, as specified in the statute, was simply a limitation of time beyond which no person could lawfully practice medicine without being registered.

The person who failed to register within that time, but practiced as a physician, made himself liable to the penalties prescribed in the act, and is also barred by Sec. 4 of the act from recovering pay for professional services rendered subsequent to the time when he should have registered and prior to the time of his compliance with the law. A removal to another county would necessitate a new registration.

Yours truly,

J. J. VAN RIPER, Attorney General.

As the question had been asked by officers whose duty it is to enforce the law, and as it was not fully met by the forgoing opinion by the Attorney General, the question was repeated to him, "Does registration in one county legally qualify a physician to practice anywhere in the State, or is it necessary for him to be registered in every county in which he practices?" The following is his reply:

"A traveling physician who resides in this State should register in the county where he resides and procure a copy of such registration duly certified by the county clerk of the county where such registration is had. With this in his possession he may safely travel anywhere in the State."

In January, 1884, a circular, with blank form for reply, was sent from this office to the county clerks, asking them to make a return to this office from the statements on file in their offices, of the names of physicians practicing in each county, with their postoffice addresses, and a statement how long each has been in practice, school of practice, and if a graduate of a medical college when and at what medical college he graduated, together with names of practitioners with whom registered students may be practicing. The clerks of all counties in which there were registered physicians complied with the request.

From the returns a summary has been prepared, stating by counties (in Exhibit 6, pages 117–118) the number of physicians registered, the ratio of registered physicians to population, the leading schools of practice under which physicians registered, and for each such school the number of graduate, non-graduate, and non-collegiate practitioners registered. Exhibit 7, pages 120–121, also states for each of the leading schools of practice, by periods of years, the time the registered physicians of each class, graduate, non-graduate, and non-collegiate, have been engaged in practice.

**EXHIBIT 6.—Medical Practitioners in Michigan Registered under Act 167 of 1883, at the beginning of the Year 1884, by Counties and by School of Practice under which Registered.**

STATE AND COUNTIES.	Popula- tion, June, 1884.	Inhabitants to one Registered Practitioner.	PRACTITIONERS, BY SCHOOL OF PRACTICE UNDER WHICH REGISTERED.																		
			All Schools.				Regular.			Allo- pathic.		Homeo- pathic.		Eclectic.		Miscel- laneous.*					
			Total.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.			
State.....	1,856,100	546	3,400	2,436	217	747	1,379	79	135	339	25	65	382	37	91	173	19	182	163	57	274
Alcona.....	4,033	1,344			3																
Allegan.....	38,724	553	70	51	3	16	23	1	1	6	1	3	7	1	2			2	12		8
Alpena.....	12,717	795	16	12	2	2	7			1	1	1	2			1			1		1
Antrim.....	8,790	463	19	9	4	6	3	1				1	1		1	4	2	3	1	1	1
Arenac.....	4,032	672	6	1	3	2			2										1	1	2
Baraga.....	3,040	3,040	1	1															1		
Barry.....	24,217	448	54	23	0	21	20		7				10		4	3		9			2
Bay.....	51,265	869	59	52	3	4	23			13	1	1	8	1	1		1				1
Benzie.....	4,394	732	6	4										1	1						
Berrien.....	37,814	548	69	47	6	16	24	1	2	8	1		7		6		3	2	4	11	3
Branch.....	27,678	374	74	50	3	21	27	2	6	5				2			1	10	2	1	3
Calhoun.....	41,526	483	86	72	6	8	37	2		2			19	2	1	6	1	3	8	1	4
Cass.....	21,268	373	57	37	3	17	22		5	2			1	4	1	1	5	1	7	4	1
Charlevoix.....	9,308	716	13	8	2	3	3			1	1							1	1	2	1
Cheboygan.....	9,973	665	15	9	1	5	4			3			1	3		1		1	1	1	4
Chippewa.....	8,372	1,196	7	5	2					5	1								1		
Clare.....	5,496	289	19	12			11		3						1	1		2			
Clinton.....	27,165	533	51	33	1	17	18	1	3	3		6		4	3			2	3		8
Crawford.....	2,330	478	5	2	2	1				1	1					1				1	1
Delta.....	9,997	1,969	5	4		1			1												
Eaton.....	31,929	469	78	55	3	20	34	1	1	4		1	11	1	5	3	1	4	3		9
Emmet.....	7,945	418	19	13	1	5	8			1	1	3					3	1	1		1
Genesee.....	38,825	422	92	61	13	18	37	12	4	5			8	1	2	5		6	6		6
Gladwin.....	1,539	513	3	1													1				
G. Traverse.....	12,111	577	21	14	3	4	1			2			4	1		4	2		1	1	1
Gratiot.....	25,090	545	46	19		27	11		3	3		3	2				8	1	1		3
Hillsdale.....	31,695	493	64	50	4	10	35	2	3			3	8	2	1	5		2	2		4
Houghton.....	26,151	1,189	22	21			21														
Huron.....	24,531	744	33	23	2	8	12		1	6		4						1	1	2	2
Ingham.....	34,960	411	85	65	6	14	37						20	1	4	2	1	3	6	1	1
Ionia.....	32,652	510	64	44	6	14	23	1	2	7	1	2	8	2	1	6	1	6		1	3
Iosco.....	10,622	817	13	12	1		9										2	1			
Isabella.....	16,077	699	23	15	1	7	7	1	5	3							2		1		1
Isle Royale.....																					
Jackson.....	45,359	567	80	63	4	13	35	1	5	5		1	15	1		3		1	5	2	6
Kalamazoo.....	35,447	449	79	63	5	11	41	2	2				1	11		1	4		2	5	3
Kalkaska.....	4,499	450	10	5			2		1					3					1		
Kent.....	84,763	422	201	131	10	60	70	3	7	23	1	19	17	3	9	10	1	14	11	2	21
Keeweenaw.....	4,677	935	5	5			4												1		
Lake.....	7,574	446	17	11	1	5	4		1	4				3		1		1		1	2
Lapeer.....	30,118	685	44	37	1	6	29	1	1				6					4			1
Leelanaw.....	7,180	798	9	5			4						1	1		1					2
Lenawee.....	49,324	418	118	89	2	27	7		7	12		4	10			8		4	6	1	12
Livingston.....	25,723	691	37	29	2	6	17		1	3	1		5			2		1	2	1	4
Mackinac.....	5,163	738	7	7			3			3								4	1		1
Macomb.....	31,330	540	58	38	2	18	22	1	4	4		1	6	1	3	1		4	5		6
Manistee.....	19,859	1,045	19	15		1				3				5	2					1	

\* Includes *botanic, eclectic, not given*, and all others below line No. 5 in Exhibit 7, pages 120-121.

† No census returns were received from Isle Royal for 1884; by census of 1880, the population was 55. May 7, 1884, the postmaster at Hancock wrote "postoffice [at Isle Royal] discontinued; no one on the island."



## EXHIBIT 6.—Continued.

COUNTIES.	Popula- tion, June, 1884.	Inhabitants to one Registered Practitioner.	PRACTITIONERS, BY SCHOOL OF PRACTICE UNDER WHICH REGISTERED.																	
			All Schools.				Regular.			Allo- pathic.		Homeo- pathic.		Eclectic.		Miscel- laneous.*				
			Total.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.		
Manitowish	873																			
Marquette	31,370	1,012	31	31						29			2							
Mason	13,431	839	16	13	2	1	3			6			2					2	1	
Mecosta	20,632	573	36	22	4	10	17	3	5	1			3	1	1				3	
Menominee	19,129	1,594	12	12			9			1			1		1			1		
Midland	8,784	586	15	12		3	8			2		1	1		1					
Misaukee	3,388	1,129	3	2			1						1						1	
Monroe	33,344	877	38	33	1	4	27	1	3				5		1					
Montcalm	35,423	448	79	44	2	33	24		4	6	1	2	6		5	4	1	12	10	
Montmorency	846	846	7	1																
Muskegon	37,681	618	61	44	5	12	21		3	7	2	1	10		2	3	1	3	2	
Newaygo	19,655	560	34	15	2	17	7	2	4	4		2	3		3			1		
Oakland	41,167	416	99	69	11	19	56	4	10				10	4	1	3	1	5	2	
Oceana	14,557	693	21	7		14	6		5						4	1			3	
Ogemaw	3,641	723	5	2	1	2	2					1			1					
Ontonagon	4,838	1,210	4	3		1									1			3		
Oscoda	13,989	482	29	19			12		1	1			4		1			3	1	
Oscoda	1,376	1,376	1			1							1							
Osego	3,907	391	10	5	3	2	2	2					2						2	
Presque Isle	4,067	2,034	2	2			17	1	2	4		5	4	2		3		2	4	
Roscommon	2,610	326	8	4	2	2				4	1	1								
Saginaw	75,813	654	116	84	10	22	64	7	8				11	2	1	5	1	6	4	
Sanilac	29,623	6	34	27	5	12	12	3	1	7	1	1	2		1	4		1	2	
Sch. Olcraft	3,853	771	5	4			3								1					
Shiawassee	28,098	439	64	45	4	15	24	2	4	1			9	1	1	5		2	6	
St. Clair	46,812	571	82	56	6	20	40			5			8	1	1			3	2	
St. Joseph	26,299	360	73	58	4	11				39	2	4	9		8			2	2	
Tuscola	29,935	624	48	36	4	8	19	1	2	5	1	1	6	1	3	5		1	1	
Van Buren	30,446	448	68	37	5	26	22	1	3	1		1	4		2	6	1	9	4	
Washtenaw	41,704	512	83	67	5	11	46	2	1	3			16		4			5	2	
Wayne	189,348	539	351	298	21	32	169	8	2	64	9	7	38	2	3	11		9	16	
Wexford	10,338	422	25	16	3	6	10			1			1	1	1	3	1	3	1	

\* A postal card from the clerk of Manitowish county, dated Jan. 23, 1884, stated that there was no practicing physician in the county.

In the exhibits the term "graduates" includes those for whom the returns made to this office by the county clerks contain, in the column "when graduated," a statement of the date of graduation from a medical college, medical school, or medical association. It includes many who are not graduates of reputable medical schools. The term "non-graduates" includes those who are returned as having attended a medical college or school, but for whom the returns contain, in the column "when graduated," no statement of a date of graduation. Thus some graduates may be classified as "non-graduates" because of neglect to record the date or fact of graduation.

The term "non-collegiates" includes those who are not returned as having attended a medical college or school. Doubtless many are classified as graduates or non-graduates who should be classified as non-collegiates, but who are recorded as having attended something which they wish to be understood as a school of medicine. One practitioner is returned as a graduate of the State Normal School, which never had a medical department; four are returned

as graduates of the Michigan State Mediums' Association at Lansing, and two others report that association as the medical college attended.

According to the returns, there were 3,400 registrations; just how many physicians registered in more than one county has not been determined, though a list has been made of such repeated registrations as were noticed in making the compilation. Two physicians seem to have registered each in 30 counties, one in 23 counties, one (apparently not a resident of the State) in 16 counties, one in 15, one in 5, one in 4, one in 3, and three each in 2, making 142 registrations for twelve physicians. In Exhibit 7, pages 120-121, the numbers which should be deducted from each class because of known repeated registrations are indicated by small figures placed above and at the left of those denoting the number of registrations in each class. That these numbers to be deducted are distributed through so many classes and ages, is due to the fact that in some cases the repeated registrations for the same practitioner were not reported the same from all counties.

Excluding the foregoing known repetitions, the number of practitioners returned is 3,270, of whom 2,366, or 72 per cent, are reported to have graduated from some college, society, or institution; 197, or 6 per cent, are reported to have attended some college; and 707, or 22 per cent, are not reported to have attended a college or anything that could be called a medical school.

Grouped by the so-called "schools of practice" under which they are reported to have registered, excluding known repetitions, there are 1,578 "regulars," of whom 86 per cent are graduates; 416 "allopaths," of whom 79 per cent are graduates; 467 "homeopaths," of whom 74 per cent are graduates; 354 "eclectics," of whom 49 per cent are graduates; 40 "rational" and "scientific," "independent," and "old," of whom 95 per cent are graduates; 20, of whom 65 per cent are graduates, are returned as of "No" school; not included in the foregoing, distributed among "botanics," "electics," "physio-medics," "clairvoyants," "magnetics," "Druids," "hydropaths," "Thompsonians," etc., there are 197, of whom 34 per cent are graduates and 63 per cent non-collegiates; 198, of whom but 19 per cent are graduates, do not state to what "school of practice" they belong.

No summary has been made as to the medical colleges and schools from which practitioners have graduated, or which they have attended. The returns by county clerks are on file in this office, from which a summary can be made if such information is needed.

## EXHIBIT 7.—Registered Medical Practitioners in Michigan (under Act and by Years in Practice)

Line Number	SCHOOLS OF PRACTICE UNDER WHICH REGISTERED.	NUMBER OF PRACTITIONERS, AND												
		All Years.				Under 5 Years.			5 Years and Under 10.			10 Years and Under 15.		
		Total.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.
1	All Practitioners. ....	130 3,400	70 2,436	20 217	40 747	13 706	2 22	14 14	1 508	15 66	33 257	29 409	30 30	151 151
2	Regular <i>a</i> .....	15 1,503	14 1,379	1 79	13 135	1 418	1 10	5 5	287 287	18 18	36 36	222 222	15 15	29 29
3	Allopathic <i>b</i> .....	13 429	12 339	1 25	1 65	1 96	1 3	.....	73 73	5 5	29 29	58 58	6 6	.....
4	Homœopathic <i>c</i> .....	45 512	34 384	5 37	2 91	2 117	3 3	1 1	80 80	16 16	32 32	72 72	5 5	26 26
5	Eclectic <i>d</i> .....	20 374	173 173	19 19	182 182	40 40	1 1	2 2	37 37	9 9	67 67	23 23	1 1	43 43
6	Botanic <i>e</i> .....	54 54	2 2	1 1	51 51	.....	.....	.....	2 2	.....	19 19	.....	.....	9 9
7	Allopathic and Eclectic <i>f</i> .....	6 6	4 4	.....	2 2	1 1	.....	.....	.....	.....	1 1	1 1	.....	.....
8	Eclectic and Homeopathic <i>g</i> ..	26 26	3 3	10 10	13 13	.....	.....	.....	2 2	10 10	11 11	.....	.....	1 1
9	Eclectic and Botanic <i>h</i> .....	6 6	.....	.....	6 6	.....	.....	.....	.....	.....	1 1	.....	.....	2 2
10	Clairvoyant <i>i</i> .....	8 8	.....	.....	8 8	.....	.....	.....	.....	.....	2 2	.....	.....	3 3
11	Electric.....	2 32	18 18	.....	14 14	4 4	.....	.....	5 5	.....	9 9	3 3	.....	2 2
12	Independent.....	6 6	6 6	.....	.....	1 1	.....	.....	1 1	.....	.....	.....	.....	.....
13	Old.....	12 12	12 12	.....	.....	4 4	.....	.....	1 1	.....	.....	2 2	.....	.....
14	Physio-Medical.....	16 16	9 9	1 1	6 6	2 2	.....	.....	2 2	1 1	1 1	1 1	.....	3 3
15	Rational <i>j</i> .....	18 18	16 16	.....	2 2	5 5	.....	.....	2 2	.....	.....	1 1	.....	.....
16	Scientific.....	4 4	4 4	.....	.....	1 1	.....	.....	.....	.....	.....	2 2	.....	.....
17	Veterinary.....	7 7	.....	.....	7 7	.....	.....	.....	.....	.....	3 3	.....	.....	1 1
18	Miscellaneous <i>k</i> .....	1 66	1 33	.....	31 31	8 8	.....	.....	8 8	.....	13 13	6 6	1 1	6 6
19	No.....	7 27	4 17	2 2	1 8	1 1	1 1	1 1	1 1	1 1	3 3	7 7	.....	1 1
20	Not given.....	6 204	3 37	3 41	3 126	8 8	4 4	5 5	7 7	6 6	30 30	6 6	2 2	17 17

NOTE.—The small figures above and at the left of the main figures in Exhibit 7 are explained on page 119.

*a* Regular includes 5 regular allopathic (4 graduates, 1 non-collegiate); 1 regular rational, graduate; 1 regular or scientific, graduate; 1 regular and scientific, graduate; and 1 old or regular, non-collegiate.

*b* Allopathic includes 1 allopathic and polyopathic, graduate.

*c* Homeopathic includes 2 homeopathic and liberal, graduates; 1 rational and homeopathic, graduate; 3 regular and homeopathic, (2 graduates, 1 non-collegiate); 1 old school homeopathic and hydropathic, non-collegiate; 2 homeopathic and allopathic, graduates.

*d* Eclectic includes 1 new eclectic, graduate; also 1 American eclectic, 1 liberal eclectic, 1 magnetic and eclectic, non-collegiates.

*e* Botanic includes 1 botanic or rational, 1 botanic and midwifery, 3 botanic and magnetic, 1 botanic and hygienic, 1 botanic and Indian, all non-collegiates.

*f* Allopathic and eclectic includes 1 eclectic and allopathic.

*g* Eclectic and homeopathic includes 1 homeopathic and eclectic.



167 of 1883) at the Beginning of the Year 1884, by Schools of Practice in Periods of Five Years.

## YEARS THEY HAVE BEEN IN PRACTICE.

15 Years and Under 20.			20 Years and Under 25.			25 Years and Under 30.			30 Years and Under 35.			35 Years and Under 40.			40 Years and More.			Not given as Required by Law.		
Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.	Graduates.	Non-Graduates.	Non-Collegiates.
1	1	1	22	1	2	2	1	1										2	1	3
277	20	106	173	10	58	118	11	43	94	17	48	46	6	18	19	2	16	86	30	36
169	7	23	77	6	7	67	5	6	58	11	15	26	5	4	13	---	7	51	2	3
35	2	12	21	---	4	18	4	4	16	3	6	6	1	1	4	1	---	9	---	---
33	6	13	42	3	7	17	2	4	8	---	4	2	---	---	---	---	1	13	2	3
28	1	27	14	1	14	10	2	12	6	1	7	4	---	4	1	1	3	5	2	3
---	1	5	---	---	3	---	---	5	---	---	4	---	---	4	---	---	2	---	---	---
---	---	---	---	---	---	---	---	1	1	---	---	1	---	---	---	---	---	---	---	---
1	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	1	---	---	2	---	---	---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1	---	2	4	---	1	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---
1	---	---	1	---	---	1	---	---	---	---	---	---	---	---	---	---	1	---	---	---
1	---	---	2	---	---	---	---	---	2	---	---	---	---	---	---	---	---	---	---	---
---	---	1	---	---	2	---	---	---	---	---	---	---	---	---	---	---	4	---	---	---
2	---	1	22	---	---	2	---	1	1	---	---	1	---	---	---	---	---	---	---	---
1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
---	---	1	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---	---	1
5	---	6	3	---	2	---	---	---	1	---	3	2	---	---	---	---	1	---	1	---
2	---	1	1	---	1	2	---	---	---	---	---	1	---	---	---	---	---	2	---	1
7	3	14	3	---	12	1	1	7	1	2	9	3	---	5	---	---	2	1	23	25

*h Eclectic and botanic includes 2 botanic and eclectic.*

*i Clairvoyant includes 1 clairvoyant and healing, 1 clairvoyant and eclectic, 1 eclectic, herbalist, and clairvoyant.*

*j Rational includes 1 rational or old, graduate.*

*k Miscellaneous includes 4 Druid, graduates; 4 medicine and surgery, graduates; 2 medicine and midwifery, non-collegiates; 4 midwifery, non-collegiate; 3 Thompsonian, (1 graduate, 2 non-collegiate); 2 hydropathic (1 graduate, 1 non-collegiate); 2 electropathic, graduates; 1 electro, non-graduate; 1 electric, non-collegiate; 2 vitapathic, graduates; 1 vitopathy, non-collegiate; 1 vitopathy, non-collegiate; 2 Britanic, non-collegiate; 2 common sense (1 graduate, 1 non-collegiate); also one each alcopathic, American, cosmopolitan, euro-pathic, ellictic, electric, exclusive, forest, general, Harvard, Hahnemann, herbalist and magnetic, Homotom, Indian mode, Klinich, liber il, magnetic, Mediums' Medical Association, non-sectarian, new oculist, oculist and aurist, orthodox, physician and surgeon, phisio-cometic, Parimariba, phisio, polypathic, patent medicine manufacturer, reform, Royal Infirmary, school of nature, several, and Trinity College.*

## POISONOUS CHEESE.

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### SICKNESS IN MICHIGAN CAUSED BY POISONOUS CHEESE, AND EFFORTS TO LEARN THE NATURE AND ORIGIN OF THE POISON.

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REPORT BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH.

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Within thirteen months (Aug., 1883, to Aug., 1884), in widely different parts of the State, large numbers of persons have been taken suddenly and violently ill, all within a few hours of each other, and all in a similar manner. There have been eight such local outbreaks in the time covered by this report. In one locality over one hundred persons were thus affected, in another locality thirty persons, and in the eight outbreaks altogether, over 212 persons.

The facts reported and brought out by inquiries from this office, and set forth more or less fully in this report, show that the sickness was unquestionably due to cheese. The evidence of this may be summarized as follows:—

This was the belief of the attending physicians and of the persons themselves. In each case the sickness occurred among those who had eaten cheese. It supervened within a few hours after such eating, attacked more or less severely all who ate of the cheese, and did not attack others. Of persons living in the same house, and presumably under similar conditions, only those who ate cheese suffered.

#### THE CAUSE OF THE SICKNESS WAS TRACED TO PARTICULAR CHEESES.

Of the great number of cheeses cut and eaten in Michigan during the year covered by these reports, only a few gave any cause for complaint. So far as can be determined from replies by correspondents, only ten cheeses were concerned in the entire series of poisonings here recorded. Six of these were made by one manufacturer, and these six all probably came from the same factory, though this point was not clearly established as regards two samples.\* Statements by the manufacturer also lead to the belief that the bad cheeses were the product of only one vat in his factory, and were all made in the month of May within a few days of each other.†

The following account of outbreaks in Michigan of poisoning by cheese is summarized from replies by health officers and other correspondents of this Board. The outbreaks are noted in order of occurrence as follows:

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\* Since the above was written, Mr. Horton writes that he owns three cheese factories, two of which have been in operation many years, and one built last year. He never had any trouble with cheese until 1883. All the poisonous cheeses were made at the new factory, and within a few weeks after work began there for the first time.

† Since the above was written, other outbreaks of poisoning have occurred from cheese made by Mr. Horton in September or October, 1884.

## 1.—CASES AT OXFORD, MICH., IN AUGUST, 1883.

(Reported by C. S. Park, M. D., of Hubbardston, Mich., and by E. P. B. Wilder, M. D., Health Officer, Oxford, Mich.)

This outbreak occurred in the first part of August, 1883. There were in all fourteen or fifteen cases, which were undoubtedly caused by the cheese. Those who ate of it were taken with nausea and vomiting, with violent cramping spells. There were no fatal cases, and the symptoms passed away in from twelve to twenty-four hours.

The cheese was sold by two firms in Oxford, and was procured by them from a wholesale house in Detroit. It was made by the Eagle Cheese Co., at Lyons, Ohio.

## 2.—CASES AT MIDDLEVILLE, BARRY COUNTY, MAY 30, 1884.

(Reported by A. Hanlon, M. D., druggist; E. C. Whitney, grocer; and G. W. Mattison, M. D., Health Officer.)

Dr. Mattison wrote May 31 as follows:

"Quite a panic occurred in our village and vicinity last evening owing to a quite large number of people being taken suddenly and violently sick, the cause being at once traced to eating cheese purchased of one of our grocers. It was a new cheese just cut and put upon sale. It being a public day and many in from the country, some of it had been sold the country people for lunch. Most of it was eaten about 2 o'clock P. M., and, from 2 to 4 hours after, nearly every one who had eaten of the cheese was taken ill, and some came near dying, but all are now quite nearly recovered."

Dr. Hanlon wrote on May 31 as follows:

"Every person who ate it [the cheese] were taken violently sick. They were attacked with vomiting of thin, watery substance at first, then it would become a sort of reddish substance and thicker; at the same time they had a diarrhoea, the evacuation being very thin and watery. There was not much pain except in the stomach. The tongue was coated white, but this morning the tongues of those who were very bad are red and dry; considerable gastric irritation. The pulse was very weak and irregular, the face pale, blue-white (cadaverous). One little boy who ate heartily of it came very near dying; he became spotted all over with blue spots."

Dr. Hanlon at this writing knew of 50 or 60 persons made sick by the cheese.

Dr. Mattison afterwards (June 6) furnished the following additional particulars:

"Mr. Whitney [the grocer] sold about one-fourth of a large cheese, and upwards of one hundred persons were sick during the afternoon and night of that day (May 30). Most of those who were sick have recovered, though there is one lady in the village who is still too ill to be comfortable. She continues to be very thirsty, and complains of dryness of the throat and fauces."

This poisoning was thought by some to be due to arsenic said to be used in the manufacture of the cheese.

This cheese was made at G. B. Horton's "Old Original Fairfield Factory," Fruitridge, Lenawee county, Mich.

## 3.—CASES AT JEROME, HILLSDALE COUNTY, JUNE 7 AND 9, 1884.

(Reported by A. A. Dunton, Jr., M. D.)

There were two outbreaks of cheese poisoning in Jerome, followed in a few days by a lesser outbreak (3 cases) of poisoning from eating pressed beef.

Mr. Dunton wrote August 25:

"July 7 a cheese was cut here which made several very sick, but they all thought it only cholera morbus. June 9 a second cheese was cut (from the same house), and this is the one from which 24 cases were reported. The store was to change hands the next day and they were selling very cheap. This is the reason why so many were affected."

Earlier letters from him stated that the symptoms in all cases were those of



an irritant poison—vomiting, purging, great pain and depression, small and feeble pulse, etc. Dr. Dunton thought the coloring matter in the cheese was the source of the trouble. He could see it, in red streaks, extending through the cheese. He says:

"Some who ate most were not affected, while many who merely tasted were among the sickest, I thought the poison to be due to an aniline coloring matter."

The cheese was made by G. B. Horton, Fruitridge, Lenawee county, Mich.

#### 4.—CASES AT JONESVILLE, HILLSDALE COUNTY, JUNE 7, 1884.

(Reported by Geo. W. Stevens, M. D., Health Officer).

Ten cases of poisoning occurred at Jonesville. The main symptoms were purging and vomiting.

"The cheese was thrown up whole in some cases, in others partially digested. Some parties only ate a very small taste, yet were as severely taken as any of those who ate large quantities of the cheese. I could not see any toxic effects, only symptoms of indigestion. There were in every case large accumulations of gas on the stomach and bowels, denoting fermentation of ingesta."

This cheese was made by G. B. Horton, Fruitridge, Lenawee county, Mich.

#### 5.—CASES AT FLINT, MICH., JUNE, 1884.

Dr. B. F. Miller of Flint reports that some time in June, 1884, four members of his family were taken sick one evening within three hours after eating cheese, and with symptoms of poisoning similar to those above mentioned. He thinks the cheese was made in Clio, Genesee county, Mich.

#### 6.—CASES AT BIG RAPIDS, MICH., JULY 1, 1884.

(Reported by Irus W. Badger, M. D., Health Officer of Big Rapids).

These cases occurred on July 1. About thirty persons ate of the cheese, and a few of them came under medical treatment. One of the severest cases is described as follows:

"Cold hands and feet; appeared to have a chill; intense vomiting and retching; a dry tongue and throat, and very thirsty; a hot, burning sensation in the stomach, which retained nothing for six hours. The vomiting soon after subsided, leaving a prostrated condition of the system, which the second day after was followed by fever. In other cases there was diarrhoea besides the symptoms given above, and in one case there was 'great prostration and collapse for a time.' In some cases the vomiting and purging lasted three or four hours. All that ate of the cheese, so far as can be determined, were attacked with vomiting. The severity of the attack was probably due to the quantity eaten. When but a little of it was eaten, they were not sick till next day, as late, some of them, as afternoon. Another point quite satisfactorily proved was that where several persons attended the social from the same family, only those were sick who ate the cheese."

The cheese was made at one of the factories of G. B. Horton.

#### 7.—CASES AT CARSON CITY, MICH., JULY 8 OR 9, 1884.

(Reported by C. S. Park, M. D., of Hubbardston, Mich., and by J. Tennant, M. D., of Carson City Mich.)

Thirteen cases occurred in Carson City and vicinity, with symptoms as follows: "Pain and burning sensation in stomach, intense vomiting and purging, feeble pulse, cold extremities, and tendency to collapse." All recovered in from two to four days from date of attack. The cheese was manufactured at one of the establishments of G. B. Horton, Fruitridge, Lenawee county, Mich.

#### 8.—CASES AT LOWELL, MICH., AUGUST 26, 1884.

(Reported by Drs. A. B. Grant and O. C. McDannell of Lowell, Mich.)

Dr. McDannell, Health Officer, wrote to this office, Aug. 30:

"There have come to my knowledge twelve cases of poisoning, all occurring in different families,

and in different sections of this township,—all on the afternoon and evening of the 26th of this month. I have traced them all to a particular cheese that one of our dealers cut and sold on that day, a sample of which I send you by this mail. \* \* \* The symptoms of those who ate the cheese were such as we might expect from the irritant poisons, viz.: Violent vomiting and purging for from one to three hours, followed by pain in stomach and bowels, with rapid fall of temperature, profuse, cold perspiration, with tendency to failure of heart's action, then reaction with increase of pain, tenesmus, thirst, etc. No deaths; no paralysis or convulsions. All were taken within from thirty minutes to two hours after eating the cheese."

Dr. Grant wrote, Aug. 28, as follows respecting symptoms, etc.

"Severe vomiting, followed by diarrhea and great prostration almost to swooning."

And again, Aug. 31, in reply to inquiries:

"Violent symptoms—vomiting, diarrhea, cramps in extremities (above knees and elbows) lasting about three or four hours. The larger the amount of cheese taken the more violent were the symptoms. The time after eating before vomiting took place was from three-fourths to one and one-half hours."

Dr. Grant mentions thirteen cases.

This cheese was traced to the wholesale house from which it was procured, but the factory where it was made could not be positively ascertained.

#### SUPPOSED CAUSES OF POISONOUS CHEESE.

The cause of the poisoning was variously ascribed (1) to red-lead, chrome-yellow, arsenic, or aniline, believed to be used in some of the processes of cheese-making, or to enter as adulterants into other materials so used; (2) to mineral poisons dissolved from the metallic walls of the vats or other vessels in which the milk or curd was kept; (3) to poisonous plants eaten by the cows; and (4) to products of decomposition (vegetable or animal) originating in the milk, curd, or cheese, or carelessly or purposely introduced into them in some stage of manufacture, or before the milk was delivered at the factory.

The sudden onset of the sickness, and the peculiar train of symptoms, somewhat favored the belief that it was due to a mineral poison. This was also strengthened by the fact that some of the cheeses were highly colored in streaks, and by the statement of two old cheese-makers that when the rennet was poor arsenic was sometimes used to quicken the curd.

Samples of the poisonous cheese were asked for and received from the various localities. With a view to learning whether any of the suspected poisons were present, some of the cheese from Middleville was sent to Prof. V. C. Vaughan, of Michigan University, for analysis. In Dr. Vaughan's absence, his assistant, Dr. C. P. Pengra, made an analysis and reported that the cheese contained no poisonous metal, as lead, copper, arsenic, or iron. Analyses of poisonous cheeses made in previous years by Prof. R. C. Kedzie and other chemists, have given similar results. Such analyses rule out the theory of mineral poisoning.

The symptoms detailed do not agree very closely with those of recorded cases of aniline poisoning.

Mr. G. B. Horton suggested that the trouble might be due to a weed upon which the cows fed. Mr. C. B. Lambert attributed the poisoning to decomposition in the milk, induced by carrying it from the dairy to the factory in the same cans in which decomposing whey was carried from the factory to the farms. He cited one factory where this was done, and believed that the practice was common. He thought he had seen bad results from this practice in the factory mentioned. A somewhat careful inquiry did not, however, show that any great amount of sickness had resulted from eating cheese made in this factory. Mr. Lambert said he had been made sick by tasting curds,

and that he had traced cases of poisoning to cheese made by him. Mr. Lambert also said sour milk was sometimes used to hasten the fermentation, and that if the maker had neglected to save milk for this purpose, he got it out of the whey tank.

With a view to learning more of the process of cheese-making, the following letter of inquiry was sent to Mr. Horton:

MICHIGAN STATE BOARD OF HEALTH,  
OFFICE OF THE SECRETARY, Lansing, Michigan, Sept. 5, 1884. }

G. B. Horton, Cheese Manufacturer, Fruitridge, Lenawee county, Mich.:—

DEAR SIR,—Very many cases of cheese-poisoning have been reported to this office this summer and our present ignorance of the cause is so great, and the interest is so general, that I should be very glad to have your replies to the following questions:—

1. How many cheeses are usually made in one lot?
2. How many cheeses can be made from one rennet?
3. Is one rennet used for making more than one lot of cheeses? or (4) are several rennets used in making one lot of cheeses?
5. How long does a rennet usually last?
6. Please describe carefully the process of cheese-making as regards the use of rennet.
7. How many rennets were used by you in April or May last, or during the time when the poisonous cheeses were made?
8. Did you notice, or have you since recalled, any peculiarity in the rennet, or rennets, used at that time for making the cheeses which have since proved to be poisonous?
9. Did you notice at that time any peculiarity in the behavior of the curd on the addition of the rennet?
10. From whence are the rennets obtained?

If you can furnish prompt, full, and accurate replies to these questions, it may furnish a clue to the cause of the poisoning. \* \* \* \* \*

Very respectfully,

HENRY B. BAKER, Secretary.

Mr. Horton immediately replied to the above inquiries as follows:

1. Six to eight.
2. Two hundred to five hundred pounds.
3. Yes.
4. Several rennets are used.
5. Spent rennets are taken out and fresh ones added every day.
6. Rennet is prepared in a stone crock by adding water or sweet whey. The liquor is used to coagulate milk. Rennet is kept sweet with salt.
7. There were two rennets taken out of the crock and two fresh ones added each day during that time.
8. No.
9. No.
10. Some are home rennets and some are imported.

I do not think it is probable that rennet is the cause. We made cheese in two vats. The same rennet was used in both. But one vat gave bad cheese each day when any was bad.

I will send you a sample of weed for experiment. I would like to know its properties, and would like to have some of the extract added to good milk and then made into cheese. I hope the enquiry will continue, and anything I can do to aid will be cheerfully done. I would like to have you visit my place and help conduct some experiments.

Respectfully,

G. B. HORTON.

Another letter was sent to Mr. Horton, Sept. 15, making the following additional inquiries:—

1. What are your reasons for attributing the bad cheese to only one vat?
2. When did you ascertain that one vat only gave bad cheese?
3. Was the milk put into the two vats indiscriminately, or did the milk from one dairy always go into the same vat?
4. Supposing the cause to be something the cows ate, or some quality of the milk is there any way to determine which cows or dairies the milk came from?

Mr. Horton's attention was also called to an article by Mr. Lambert in the



"Michigan Tradesman," attributing the mischief to decomposing whey, as above noticed. Mr. Horton replied as follows:—

*Fruitridge, Mich., Sept. 20, 1884.*

*Henry B. Baker, Secretary State Board of Health, Lansing, Mich.:—*

DEAR SIR,—Copy of "Michigan Tradesman" received. I have read with much interest the article on cheese-poisoning by Mr. C. B. Lambert. His theory cannot apply to my case. The factory where the cheese was made is new throughout. The cheese-making had been going on but about twenty days when the trouble commenced. The patrons of the factory do not draw whey home in milk cans or otherwise, as the whey is all fed from a large tank situated about forty rods from the factory. No whey is drawn away. From the fact that everything is new, and the trouble was so early in the season, I cannot think the trouble came from anything putrid or decayed about the factory.

I am quite sure it comes in the milk in some form.

### *Answers to Questions.*

1. About one-half of the cheeses made on the fatal days were good and one-half bad. So, I conclude, as I was making in two vats with about equal quantities in each, that only one vat was poisoned. This is also the experience of others who have had the same difficulty, and tests have been made to substantiate the position.

2. This question is practically answered in the above.

3. The milk from a dairy is very rarely divided, but nearly always goes into one vat. The milk as it arrives at the factory is put into one vat until it is full, when the next vat is filled in turn.

4. As no trouble is suspected when the cheeses are being made, and does not become known until they are put upon the market, and by that time the cause of the poisoning has ceased, perhaps not to be renewed in twenty years, I cannot see how experiments are to be conducted to place the cause, or the bad milk, upon a certain dairy. If the trouble was for a long duration, it could be traced to some source, but as it may not be but one day in a year, or one day in twenty years, the task is difficult.

5. As the bad cheese is not discovered until about thirty days after it is made, peculiarities in process of making would not be definitely placed, inasmuch as no two days' cheese works just alike.

6. I know of factories that have never had a case of sick cheese, and the patrons carry home whey in cans. I also know of factories that never allow any whey to be carried home in any form, which have had severe cases of cheese-poison.

I have never heard a theory advanced concerning this trouble but that circumstances and known facts could be called up to say that it cannot possibly be that.

\* \* \* \* \*  
Respectfully,

G. B. HORTON.

### PHYSICAL AND MICROSCOPICAL APPEARANCES OF THE POISONOUS CHEESES.

There is no reason to suppose that the cheeses when first cut were affected by ordinary molds; and, in most instances, there were no appearances of mold on the cheeses *when first received*. Most of the samples were fairly good looking, but differed, in several particulars, from good cheese.

1. The taste of the samples received was, for the most part, such as would lead to their rejection. This taste may, however, have been less noticeable when the cheese was first cut.\*

2. There was also a peculiar odor, about the cheese, which was, in some instances, sufficient to fill a good-sized room. This smell was attributed to caprylic or caproic acid, resulting from decomposition of the fatty parts of the cheese, but may have been due to butyric acid or some other substance.

3. When the cheese was cut or broken a nearly colorless volatile liquid oozed from the pores in considerable quantity. In some instances this liquid was very abundant. In all cases, when tested by litmus, it gave a strongly acid reaction.

\* A cheese which caused serious sickness in a family in Lansing, Mich., Jan. 1, 1885, was free from mold was not high-colored, but light colored, and was of firm consistence; it had a strong taste, not, however, noticeably disagreeable. A peculiar odor was present, but there was no liquid of any consequence in the pores. This cheese was made by Mr. G. B. Horton.

4. This liquid, as well as the substance of the cheese, was found to be swarming with micro-organisms.\* In one instance threads of mycelium were also seen. Besides *Bacillus subtilis*, Cohn (believed to be normally present in ripening cheese) various other organisms were detected, some of which could not be identified, while others were believed to be identical with *Bacillus amylobacter*, Van Tiegh., and with the ordinary agent of putrefaction, *Bacterium termo*, Ehrb. The form believed to be *Bacillus amylobacter* was less abundant in the samples examined than were *Bacillus subtilis* or *Bacterium termo*. It was "tadpole shape" with a large spore in the blunt extremity; no motion was observed in it. Samples of the Lowell cheese, examined Sept. 1, were found swarming with actively-moving figure-eight organisms, resembling *Bacterium termo*; it also contained great numbers of larger, undulatory-moving, rod-like bacilli, much resembling figures, descriptions, and verified slides of *Bacillus subtilis*, Cohn. On adding a drop of 85 per cent alcohol to a bit of cheese on the slide and then crushing it out under the cover-glass, the bacteria were deprived of all motion. Very great numbers of *Bacillus subtilis* were then plainly visible, all straightened out and motionless. On adding a purple aniline ink to the alcohol, the cheese was stained while the bacteria remained nearly or quite colorless.

Whether these micro-organisms had anything to do with the sickness is uncertain. There are some reasons for believing they did.

1. The sickness did not immediately supervene on the eating of the cheese, but occurred in from one-half hour to four or more hours after its ingestion. Some of these bacteria may find in the stomach an abundance of nutrient material and a proper temperature for rapid multiplication.

2. In the most extensive and serious outbreaks, the severity of the sickness was in proportion to the amount of the cheese eaten, and it is in one instance expressly stated that when only a small quantity was eaten the sickness did not occur until the next day. This last mentioned fact is what we might expect if the sickness were due to bacteria, since if only a few were ingested a longer time would elapse before they could multiply in quantities sufficient to seriously inconvenience the functions of the body.

#### INVESTIGATIONS BY EXPERTS.

Immediately upon receipt of the cheese from Middleville, Jerome, and Lowell, samples were forwarded to Prof. Victor C. Vaughan, the committee of this Board on "foods, drinks, and water supply," and on "poisons, explosives," etc, with the request that he make as full an investigation as possible. His final report has not yet been received. If received in time, it will be found on pages following in this report. Samples of the different cheeses were also sent to the microscopist, Prof. T. J. Burrill, of the Illinois State Industrial University, for microscopic examination, and for culture experiments on the lower animals. Prof. Burrill's report is not completed. Later, some of the cheese which had caused sickness was sent to Dr. Geo. M. Sternberg, surgeon United States Army, author of works on "Bacteria," "Photo-Micrography," etc.

It is to be hoped that these investigations which this Board has provided for may throw light on the causation of these outbreaks, as well as on the whole obscure subject of poisoning by animal food which is usually wholesome.

\* The examination was made with R. & J. Beck's achromatic object glasses, principally with the 1-10th inch immersion (No. 81).

# PRINCIPAL METEOROLOGICAL CONDITIONS IN MICHIGAN IN 1883.

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A COMPILATION OF REPORTS BY OBSERVERS FOR THE  
STATE BOARD OF HEALTH AND FOR THE  
UNITED STATES SIGNAL SERVICE.

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BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

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For each of the years 1877 to 1882, inclusive, there has been published in the Annual Reports of this Board a summary relative to the principal meteorological conditions as observed for the year. This paper continues the subject for the year 1883. The names of the observers for 1883 and the months for which copies of their registers of meteorological conditions were received from each are stated in Exhibit 8, page 130. In Exhibit 9, page 131, is given the latitude, longitude, and elevation of each station. In the tables which follow, reports received from any observer for less than half the year have not been used. Reports for less than twelve months of the year have not been included in the average line for the localities represented in any table.

The principal conditions treated in the following tables are temperature and humidity of the air, cloudiness, rainfall, ozone, velocity, and direction of the wind, and pressure of the atmosphere. The tables on each subject are illustrated by diagrams representing to the eye variations in the given condition from month to month through the year, at the several localities represented.

## METEOROLOGICAL CHARACTERISTICS FOR THE YEAR 1883.

At the State Agricultural College, near Lansing, the average temperature for 1883 was  $4.05^{\circ}$  lower than for 1882, and  $3.33^{\circ}$  lower than the average for the preceding 19 years; the annual range of temperature was  $12^{\circ}$  greater than in 1882, and  $2^{\circ}$  less than the average annual range for the preceding 10 years; the average monthly range of temperature was  $8^{\circ}$  greater than in 1882, and  $1^{\circ}$  greater than the average for the 10 preceding years; the average daily range of temperature was  $1.03^{\circ}$  greater than in 1882, and  $.94^{\circ}$  less than the average for the preceding 9 years; the average cloudiness was one per cent less than in 1882, and equal to the average for the preceding 19 years; the rainfall (rain and melted snow) was 15.86 in. more than in 1882, and 17.15 in. more than the average for the preceding 19 years; the average atmospheric pressure for the year 1883 was equal to that of 1882, and .045 in. greater than the average for the preceding 8 years. In Exhibit 10, page 132, is given by year and months a comparison of conditions in 1883, at the Agricultural College, with



those in 1882, and with averages for periods of years. November and December (naming months in order of greatest difference) were months in which the average temperature in 1883 was higher than the average for corresponding months in the preceding 19 years; January, March, May, February, August, September, July, April, October, and June were months in which the average temperature in 1883 was lower than the average for corresponding months in the preceding 19 years, at that station, which is near the central part of the State.

EXHIBIT 8.—*Names of observers whose Reports are summarized in the following Meteorological Tables and Diagrams, their Places of Observation, and the Counties and Geographical Divisions of the State in which these Places are situated, and months for which reports were received from each observer.*

NAME OF OBSERVER.	Place of Observation.	County.	Divisions of the State.*	Months (inclusive) for which Registers were Received.
J. Gilligan, Sergeant Signal Corps, U. S. A.....	Marquette.....	Marquette..	U. P....	Jan. to Dec.
Arthur Beebe.....	Manistique.....	Schoolcraft..	U. P....	Dec.
George Heathcote, Private, Signal Corps, U. S. A.....	Escanaba.....	Delta.....	U. P....	Jan. to Nov.
L. M. Pindell, Sergt. Signal Corps, U. S. A.....	Escanaba.....	Delta.....	U. P....	Dec.
Samuel J. Power, M. D.....	Mackinaw City.....	Cheboygan..	N.....	Last 6 days in July, and month of Aug.
D. B. Notson, Sergt. Signal Corps, U. S. A.....	Mackinaw City.....	Cheboygan..	N.....	Sept. to Dec.
S. E. Wait.....	Traverse City.....	G. Traverse..	N. W....	Jan. to Dec.
J. E. Fair.....	Harrisville.....	Alpena.....	N. E....	Jan. to Apr.; Aug. to Dec.
James J. FitzGerald, Sergt. Signal Corps, U. S. A.....	Alpena.....	Alpena.....	N. E....	Jan. to Dec.
James S. Reeves, M. D.....	East Tawas.....	Iosco.....	N. E....	Jan. to Apr.; June to Aug.
Joseph E. Mueller, Sergeant Signal Corps, U. S. A.....	Grand Haven.....	Ottawa.....	W.....	Jan. to June, Nov. & Dec.
William H. Fallon, Private, Signal Corps, U. S. A.....	Grand Haven.....	Ottawa.....	W.....	July to Oct.
Fred Sweet.....	Grand Rapids.....	Kent.....	W.....	Sept. to Dec.
E. S. Richardson, M. D.....	Reed City.....	Osceola.....	W.....	Jan. to Dec.
John S. Cankins, M. D.....	Thornville.....	Lapeer.....	B. & E..	Jan. to Dec.
J. W. Kimball.....	Port Austin.....	Huron.....	B. & E..	Jan. to Dec.
C. E. Swift.....	Lexington.....	Sanilac.....	B. & E..	Oct. to Dec.
W. O. Bailey, Sergt. Signal Corps, U. S. A.....	Port Huron.....	St. Clair.....	B. & E..	Jan. to Mar.
M. H. Perry, Sergeant Signal Corps, U. S. A.....	Port Huron.....	St. Clair.....	B. & E..	April to Dec.
Fred Sweet.....	Hastings.....	Barry.....	C.....	Jan. to Apr.
Prof. R. C. Kedzie.....	Agricult'l College, near Lansing.....	Ingham.....	C.....	Jan. to Dec.
Rev. J. Pierson.....	Ionia.....	Ionia.....	C.....	Jan. to Dec.
Erwin F. Smith.....	Office State B'd of Health, Lansing..	Ingham.....	C.....	Jan. to July.
Eugene J. Rauchfuss.....	Office State B'd of Health, Lansing..	Ingham.....	C.....	Aug. to Dec.
G. G. Gordon, M. D.....	Swartz Creek.....	Genesee.....	C.....	Feb. to Dec.
Lee S. Cobb.....	Winfield.....	Ingham.....	C.....	Jan. to Dec.
Prof. M. W. Harrington.....	University of Michigan, Ann Arbor..	Washtenaw..	S. C....	Jan. to Dec.
J. H. Kellogg, M. D.....	Battle Creek.....	Calhoun.....	S. C....	Jan. to Dec.
F. D. Parmelee.....	Hillsdale.....	Hillsdale.....	S. C....	Jan. to Dec.
Lieut. A. H. Boies.....	Hudson.....	Hillsdale.....	S. C....	Nov. to Dec.
Geo. C. Palmer, M. D., Supt.	Asylum for Insane, Kalamazoo.....	Kalamazoo..	S. C....	Jan. to Dec.
W. T. Drake.....	Marshall.....	Calhoun.....	S. C....	Jan. to Dec.
Dr. C. W. Shepard.....	Mendon.....	St. Joseph..	S. C....	Jan. to Dec.
Lewis Marvill.....	Parkville.....	St. Joseph..	S. C....	Jan. to Feb.
L. G. North, M. D.....	Tecumseh.....	Lenawee.....	S. C....	Jan. to Dec.
C. F. R. Wappenhans, Sergt. Signal Corps, U. S. A.....	Detroit.....	Wayne.....	S. E....	Jan.
E. Russell Brace, Private, Signal Corps, U. S. A.....	Detroit.....	Wayne.....	S. E....	Feb. to Dec.
Albert Yates, M. D.....	Washington.....	Macomb.....	S. E....	Jan. to Dec.

\* The counties in each division are stated in Exhibit 1, page 59.

EXHIBIT 9.—*Latitude and Longitude, Elevation above Sea Level, and the Average Temperature, and Average Barometric Pressure in 1883, at 26 Meteorological Stations in Michigan,—the names of the Stations being arranged in order by latitude, highest first.*

LOCALITIES IN ORDER OF LATITUDE,—THOSE FARTHEST NORTH, FIRST.	Latitude North.	Longitude West from Greenwich.	Altitude (Approximate) above Sea Level,— Feet.	Height of Mercury in Cistern of Barometer above Sea Level,— Feet.	Average Temperature, 1883. Degrees Fahr.	Average Atmospheric Pressure, 1883. Inches of Mercury corrected for Tem.
Marquette.....	46°33'	87°33'	638.07	673.	38.12	29.267
Escanaba.....	45°46'	87°14'	594.693	615.193	37.92	29.338
Alpena.....	45°53'	83°28'	587.9	609.5	38.70	29.344
Traverse City.....	44°45'	85°40'	598.	602.5	41.32	29.355
Harrisville.....	44°29'	83°18'	-----	-----	-----	-----
Port Austin.....	44°	82°	478.	-----	42.41	29.368
Reed City.....	43°44'	85°28'	1,016.	1,022.	41.40	28.863
Otisville.....	43°13'	83°31'	820.	-----	-----	-----
Grand Haven.....	43°53'	86°18'	595.3	616.3	44.70	29.350
Ionia.....	† 42°59'	† 85°4'	688.1	700.	43.81	-----
Port Huron.....	42°58'	82°29'	600.	630.	42.70	29.304
Thornville.....	* 42°55'	* 83°12'	975.	980.	45.78	<sup>b</sup> 28.982
Agricultural College.....	42°44'	84°29'	820.	834.	43.52	29.094
Lansing.....	† 42°44'	‡ 84°33'	c 900.	c 917.	45.69	29.059
Hastings.....	* 42°40'	* 85°17'	§ 750.	-----	-----	-----
Washington.....	42°40'	83°	746.33	752.33	43.87	29.285
Winfield.....	* 42°30'	* 84°34'	-----	-----	44.43	-----
Detroit.....	42°20'	83°2'	602.6	661.43	47.73	29.332
Battle Creek.....	* 42°20'	* 85°11'	§ 800.	-----	47.71	-----
Kalamazoo.....	42°18'	85°33'	975.	987.	45.63	29.012
Ann Arbor.....	42°17'	83°44'	930.	936.	44.37	29.074
Marshall.....	42°17'	84°58'	885.	888.	46.77	22.050
Mendon.....	* 42°2'	* 85°29'	§ 871.	-----	-----	29.137
Parkville.....	a	a	-----	-----	-----	-----
Tecumseh.....	* 42°1'	* 83°57'	835.	837.5	45.22	29.114
Hillsdale.....	†† 41°55'	†† 84°34'	§ 1,139.	-----	45.25	28.822

\* Estimated from lines on a map of Michigan issued by the General Land Office, Department of the Interior, 1878. For stations having no reference mark, the latitude and longitude were stated by the observer on the meteorological reports received.

† The exact latitude and longitude of the astronomical post at Ionia is 42°58' 52.53" N. and 85°2' 49.20" W.

‡ The exact latitude and longitude of the astronomical post placed in the ground near the new Capitol at Lansing, by the U. S. Lake Survey in 1875, as determined by the observations then made, is 42°43' 53.11" N. and 84°33' 19.68" W.

§ Estimated from data on "Railroad Profiles," pages 179-187, Annual Report of the State Board of Health for 1878.

|| Estimated from data in Tackabury's Atlas of the State of Michigan.

†† By table in Tackabury's Atlas of Michigan.

a 3½ miles west from Mendon.

b Aneroid Barometer used for January, February, and March; Green's standard used the rest of year.

c Estimated from comparisons of barometrical observations at Lansing, Port Huron, and Grand Haven, for the four years 1879-82.

EXHIBIT 10.—*Statements of Meteorological Conditions in the Year and in each Month of the Year 1883, Compared with Annual and Monthly Averages for 1882 and for several Stated Periods of Years,—from observations by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

METEOROLOG- ICAL CONDITIONS.	1883 COMPARED WITH AVERAGES FOR PREVIOUS YEARS.		In 1883 More (+), or Less (-), than in 1882.	METEOROLOG- ICAL CONDITIONS.	1883 COMPARED WITH AVERAGES FOR PREVIOUS YEARS.		In 1883 More (+), or Less (-), than in 1882.
	No. of Years Aver- aged, end'g with 1882.	More (+), or Less (-), in 1883 than the Average for Previous Years.			No. of Years Aver- aged, end'g with 1882.	More (+), or Less (-), in 1883 than the Average for Previous Years.	
YEAR 1883.				YEAR 1883.			
Av. Temp. ....	19	-3.33	-4.05	<i>Continued.</i>			
Range of Temp.*	10	-2	+12	Cloudiness.....	19	0 per ct.	-1 per ct.
Av. Monthly				Rainfall.....	19	+17.15 in.	+15.86 in.
Range of Temp.*	10	+1	+8	Atmospheric			
Av. Daily Range				Pressure.....	8	=	=
of Temp.*.....	9	-0.94	+1.03				
JANUARY.				FEBRUARY.			
Av. Temp. ....	19	-8.46	-10.50	Av. Temp. ....	19	-5.07	-15.36
Range of Temp.*	10	+3	+8	Range of Temp.*	10	+13	+25
Av. Daily Range				Av. Daily Range			
of Temp.*.....	9	+1.03	+1.10	of Temp.*.....	9	-.30	+.07
Cloudiness.....	19	-5 per ct.	-5 per ct.	Cloudiness.....	19	-3 per ct.	+5 per ct.
Rainfall.....	19	-.20 in.	+.36 in.	Rainfall.....	19	+2.68 in.	+2.22 in.
Atmospheric				Atmospheric			
Pressure.....	8	+.046	-.018	Pressure.....	8	+.195	+.198
MARCH.				APRIL.			
Av. Temp. ....	19	-7.07	-11.07	Av. Temp. ....	19	-2.35	-1.22
Range of Temp.*	10	=	+10	Range of Temp.*	10	+7	+17
Av. Daily Range				Av. Daily Range			
of Temp.*.....	9	+2.77	+3.65	of Temp.*.....	9	-1.41	+1.56
Cloudiness.....	19	-16 per ct.	-20 per ct.	Cloudiness.....	19	-2 per ct.	-3 per ct.
Rainfall.....	19	-2.03 in.	-2.87 in.	Rainfall.....	19	-.66 in.	+.02 in.
Atmospheric				Atmospheric			
Pressure.....	8	+.057	-.052	Pressure.....	8	+.029	-.059
MAY.				JUNE.			
Av. Temp. ....	19	-5.57	+.25	Av. Temp. ....	19	-2.06	-.62
Range of Temp.*	10	-10	-2	Range of Temp.*	10	-8	+2
Av. Daily Range				Av. Daily Range			
of Temp.*.....	9	-3.61	+.84	of Temp.*.....	9	-4.02	-.37
Cloudiness.....	19	+16 per ct.	+13 per ct.	Cloudiness.....	19	+12 per ct.	+9 per ct.
Rainfall.....	19	+2.67 in.	+1.62 in.	Rainfall.....	19	+7.35 in.	+5.78 in.
Atmospheric				Atmospheric			
Pressure.....	8	-.059	-.071	Pressure.....	8	-.016	+.026
JULY.				AUGUST.			
Av. Temp. ....	19	-2.83	+1.23	Av. Temp. ....	19	-4.45	-4.62
Range of Temp.*	10	-3	-3	Range of Temp.*	10	+6	+19
Av. Daily Range				Av. Daily Range			
of Temp.*.....	9	-6.21	-1.45	of Temp.*.....	9	-.50	+6.36
Cloudiness.....	19	+8 per ct.	+11 per ct.	Cloudiness.....	19	-14 per ct.	-20 per ct.
Rainfall.....	19	+7.98 in.	+8.95 in.	Rainfall.....	19	-2.69 in.	-5.54 in.
Atmospheric				Atmospheric			
Pressure.....	8	+.005	-.037	Pressure.....	8	+.085	+.079

\* By registering thermometers, set at 7 A. M., and recorded at 7 A. M. for the preceding calendar day.



EXHIBIT 10.—CONTINUED.—*Meteorological Conditions in Months for the Year 1883, Compared with Averages for Corresponding Months in Preceding Years.*

METEOROLOG.	1883 COMPARED WITH AVERAGES FOR PREVIOUS YEARS.			In 1883	METEOROLOG.	1883 COMPARED WITH AVERAGES FOR PREVIOUS YEARS.			In 1883
	ICAL CONDITIONS.	No. of Years Aver- aged, end'g with 1882.	More (+), or Less (-), in 1883 than the Average for Previous Years.			ICAL CONDITIONS.	No. of Years Aver- aged, end'g with 1882.	More (+), or Less (-), in 1883 than the Average for Previous Years.	
SEPTEMBER.					OCTOBER.				
Av. Temp. ....	19	-3.93	-3.55	Av. Temp. ....	19	-2.27	-6.50		
Range of Temp.*.	10	+1	+5	Range of Temp.*.	10	-3	+2		
Av. Daily Range of Temp.*.	9	+1.19	+3	Av. Daily Range of Temp.*.	9	-2.83	-6.17		
Cloudiness. ....	19	+4 per ct.	+10 per ct.	Cloudiness. ....	19	+12 per ct.	+20 per ct.		
Rainfall. ....	19	-.54 in.	+1.67 in.	Rainfall. ....	19	+1.20 in.	+1.02 in.		
Atmospheric Pressure. ....	8	+.053	-.037	Atmospheric Pressure. ....	8	+.072	+.033		
NOVEMBER.					DECEMBER.				
Av. Temp. ....	19	+2.90	+1.73	Av. Temp. ....	19	+.94	+1.59		
Range of Temp.*.	10	+1	=	Range of Temp.*.	10	+3	+7		
Av. Daily Range of Temp.*.	9	+1.85	+1.73	Av. Daily Range of Temp.*.	9	+.76	+2.07		
Cloudiness. ....	19	-12 per ct.	-17 per ct.	Cloudiness. ....	19	-11 per ct.	-21 per ct.		
Rainfall. ....	19	+1.82 in.	+2.15 in.	Rainfall. ....	19	-.46 in.	+.48 in.		
Atmospheric Pressure. ....	8	+.037	-.060	Atmospheric Pressure. ....	8	+.039	-.001		

\* By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

Comments on Exhibit 10 are printed on pages 129-130. The low temperature in the months from January to October, inclusive, and the great rainfall in June and July, are especially noticeable.

The following general remarks relative to temperature, frosts, effects on vegetation, migration of birds, etc., in 1883, are taken from the monthly reports by observers. The names of observers are stated in Exhibit 8, page 130.

## JANUARY.

Frost, Jan. 9.—*Hillsdale*.

A thermometer on west side of building was 13° below zero Jan. 21; 22° below Jan. 22; 12° below Jan. 23.—*Battle Creek*.

Jan. 23, 29, 30. Melting snow.—*Ionia*.

Jan. 28, 29. Trees and bushes covered with ice, which dropped off at 12 M. A cold month. Snow at the end six inches on the level, when not drifted. Ice on ponds 12 inches. Frost in ground about the same.—*Thornville*.

Melting snow on ground on Jan. 17, 27, 28, 29, 30, 31. Ground frozen 18 inches.—*Alpena*.

Frost, Jan. 1 to 31.—*Escanaba*.

Heavy frost morning of Jan. 9.—*Hastings*.

Hoar frost, Jan. 6, 18, 28, 29. Several weeks of uniformly high barometer ended on Jan. 10 with a sudden fall and indications of a storm. On this date a severe snow storm raged over Southern Minnesota, blocking up railroads and causing great suffering to live stock. There was also a very heavy fall of snow in Iowa and Northern Illinois, but only a slight snowfall at this station. Depth of snow at end of month 5 inches. Ice in Grand River 16 inches.—*Lansing*.

## FEBRUARY.

Saturday night, Feb. 3, a heavy crust formed on the snow, sufficiently strong to bear up persons, and in some places would hold up a horse; remained until Friday, Feb. 14.—*Hillsdale*.

Feb. 13, 15, 16, 19, 20, 22, 23, 28. Melting snow.—*Ionia*.

Ice storms Feb. 3, 14. A cold, stormy month, but less severe than January. Much snow, which

drifted badly, the ground at close of month being half bare. Travel has been obstructed on N. and S. roads by drifts. Since the rain and thaw of Feb. 16 the water and ice have been bad in all low places. A noticeable thing for so stormy a month is the high mean barometer. The uncovered wheat looks badly hurt by severe freezes. Peach buds are probably all killed. A robin was seen on Feb. 28.—*Thornville*.

Melting snow on ground on Feb. 9, 11, 12, 13, 14, 15, 16, 17, 21, 22, 24, 25, 28. Ground frozen, Feb. 2, 3.—*Alpena*.

Frost, Feb. 1 to 15 and 17 to 28.—*Escanaba*.

Depth of snow at close of Feb., 6 inches.—*Hastings*.

Feb. 15. Much snow has melted. Cellars and basements are flooded. 2 P. M., snow melting rapidly, temperature 50°.—*Lansing*.

#### MARCH.

Frosts, Mar. 1, 2, 14, 22.—*Marshall*.

First robin seen Mar. 1. First blackbird seen Mar. 26. Average depth of snow at close of month 4 ft. 6 in.—*Ionia*.

Robins and bluebirds returned about Mar. 10; song sparrows about Mar. 13. March has been a cold winter month, with considerable snowfall, but much clear weather. Mean temperature about 7° below long average. The last week melted the snow, but northern slopes were still covered as the month closed, and there were immense drifts along the north and south roads. There was ice in the lakes and ponds; but not much frost in the ground, owing to the protection of the snow. The wheat appears not to be worse hurt than at the beginning of the month; but peach buds and all half hardy shrubs and plants are mostly killed. There was only one night in the month that it did not freeze.—*Thornville*.

Frost from Mar. 1 to 31. Melting snow on ground on Mar. 1, 2, 6, 9, 10, 12, 13, 14, 16, 17, 18, 23, 24, 25, 26, 29, 30, 31. Ground frozen four (4) inches.—*Alpena*.

Frosts, Mar. 1 to 31, inclusive. Thaw (melting snow), Mar. 13. Bay frozen Mar. 1 to 31, inclusive.—*Escanaba*.

The temperature fell from 44° to 5° between 7 A. M. and 9 P. M. Mar. 18. Blackbird and meadow lark seen Mar. 13; not seen again during the month. Blue heron seen Mar. 25.—*Swartz Creek*.

Bluebird, Mar. 2. Frosts, Mar. 1, 2, 3, 13, 20, 21, 24, 30.—*Hastings*.

Frosts, Mar. 2, 16, 22, 23, 29. Robins and bluebirds first seen Mar. 1; orioles and chipping birds Mar. 13; blackbirds and henhawks; migratory birds abundant. Fields bare of snow, except occasional drifts, Mar. 17. Meadow larks, Mar. 31. March opened and closed with mild weather. This month has been noticeable for absence of cold storms of snow and rain. As it closes the fields are bare of snow (except some drifts); the ground is still frozen; the ice is still in Grand River. Wells and cisterns are low or dry.—*Lansing*.

#### APRIL.

Frost, April 3, 8.—*Marshall*.

April 7, frogs chirp for the first time. Last year they commenced March 1. Frost all out of ground, except in some protected places. The average depth has been 12 inches. In some exposed localities it reached the depth of 18 to 24 inches. Remnants of snow and ice remaining in shady nooks, being from snow which fell Nov. 26, 1882.—*Hillsdale*.

Frozen ground, April 1, 2, 3, 8, 12, 20, 23, 24, 25, 29. Ice, April 1, 2, 3, 8, 12, 20, 23, 24, 25, 29, 30. Hoar frost, April 2, 8, 12, 20, 25, 29. First phebe bird heard April 13.—*Ionia*.

Meadow-larks and flycatchers seen April 4. Brown thrushes and catbirds seen April 18. Plowing begun April 16. Elm trees in blossom April 22. Willows in blossom April 24. April 9, frogs first heard. April has been a cool, sunny month; there having been but 6 nights that ice did not form, and but 7 days that the maximum temperature was 60° or more. The cold, dry weather has badly injured the wheat, already seriously hurt by the severity of the winter and by the "fly" last fall. The present prospect for a crop seems poorer than it did at this season in 1881, which year gave us the poorest crop ever raised in Lapeer county. My estimate is that the yield cannot possibly exceed half an average.—*Thornville*.

Frost, April 12, 23, 29.—*Port Austin*.

Frost disappeared from ground April 20. Frosts occurred April 1, 2, 3, 6, 7, 8, 12, 13, 14, 17, 20, 21, 23, 25, 26, 29, 30.—*Alpena*.

Sparrows arrive, April 14. Ice goes out of Grand Traverse Bay night of April 14.—*Traverse City*.

Frosts, April 1, 2, 3, 6, 7, 12, 17, 18, 19, 20, 21, 23, 24, 25, 27, 28, 29, 30. Ducks appear April 12. Geese flying north, April 28. Ice cleared out on April 24. Navigation opened April 25.—*Escanaba*.

Frosts, April 1, 8, 12, 25, 29.—*Hastings*.

Frosts, April 2, 3, 8, 11, 16, 17, 20, 23, 24, 25, 29, 30. Frost disappeared April 10. Plowing begun April 9. Some oats sown April 13, but farmers did not sow generally until April 25.—*Swartz Creek*.

Hoar frost, April 2, 3, 8, 12, 29, 30. Frost all out of ground April 14. Hard frost nights of April 23, 24, 28. Night of April 24 ice formed over quarter of an inch thick. April 1, ice out of Grand River.

April 6, snowfall of 3 inches. April 7, melting snow on ground. April 11, frogs first heard piping. Appearance of spring flowers and early vegetation: Hepaticas, soft maple, hazel nut, April 14; Am. Elm in blossom; grass and wheat have suddenly become green under influence of a warm rain, April 15; red elm, poplar, pussy-willow, harbinger of spring, and early carex in blossom, April 17; spice-bush, skunk-cabbage, blood-root, April 21; English elms on lawn, April 29. April has been a pleasant month; weather mild; roads dry; no thunder storms; and rainfall below the average. Grass made a good growth during the last half of the month, but vegetation, as a whole, has been backward, owing to dry weather and cold nights.—*Lansing*

## MAY.

Frost occurred May 10, 12, 22, 23, 31.—*Mendon*.

Frost, May 6, 11, 13, 31.—*Hillsdale*.

Frost, May 11, 12, 13, 23. Ground froze May 11, 13.—*Winfield*.

Hoar frost, May 1, 11, 13, 15, 23, 24. Ice formed May 1, 6, 11. Trees in leaf: Horse-chestnut, Lombardy poplar, lilac, apple, mountain ash, soft maple, May 16; sugar maple, May 18; butternut, May 19; elm, May 21; linden, May 23; white oak, May 28. Cabbage butterflies seen May 7.—*Ionia*.

Frosts, May 1, 6, 11, 12, 16, 21. Blossoming of trees: Hazelnut, May 1; June-berry, May 19; peach, May 21; cherry, May 22; apple, May 26. Return of birds: Kingbird, yellow-bird, bobolink, May 7; whippoorwill, May 15. A cool, wet month. Temperature at least 5° below the long average. May 21 and 22 are noteworthy as two very cold days for the season. Mean temperature of 21, 40°; of 22, 39°. As the month closes corn planting is about two-thirds done. The wet weather has improved the appearance of the wheat, but the estimates of yield remain the same, *i. e.*, one-half of an average crop. Clover looks well. Spring grains do not grow much.—*Thornville*.

Frosts occurred May 1, 6, 8, 11, 12, 15, 16, 17, 22, 23, 29, 30.—*Alpena*.

Ice formed nights of May 10 and 13; frost, May 11.—*Traverse City*.

Frosts, May 1, 11, 13, 15, 16, 21.—*Escanaba*.

Frosts, May 1, 11, 12, 13, 16, 24. Red currant in blossom May 13; strawberry, May 16; cherry, 17; peach and apple, 24.—*Swartz Creek*.

Trees in blossom: Plum and cherry, May 17; pear and apple, May 21; peach and lilac, May 26. Heavy hoar frost May 11, 13. Heavy frost during the night of May 10. Young robins flying about May 20. Ground very wet from heavy rains, and Grand River unusually high. Rainfall of nearly five (5) inches during the past two weeks, May 16. Cold snow storm from N. and N. E. continuing with intermissions from 4 A. M. to 9 A. M., May 21. May has been noteworthy for low average temperature, violent winds (10th and 19th), and excessive rainfall, the precipitation being greater than that of last May, which was itself considerably above the average. The rainfall during this month exceeds the May average of 4 years (1880-83) at this station by 1.20 inches, and of 17 years at the Michigan Agricultural College by 3.32 inches. Corn planting and all spring work has been much delayed, but the rains have been favorable to grass and winter wheat. The last snow occurred May 21; the last frost May 31.—*Lansing*.

## JUNE.

Frost, June 1.—*Marshall*.

White frost, June 1.—*Kalamazoo*.

Hoar frost, June 1. Wild cherry in bloom June 15. Firefly seen June 18.—*Ionia*.

Frosts in low grounds morning of June 14. Wheat headed out about June 12.—*Thornville*.

Slight frost June 1.—*Port Austin*.

Frost, June 1.—*Alpena*.

Heavy white frost June 1.—*East Tawas*.

Frosts, June 1, 13. Ice formed June 1. Wheat in head June 10; in flower June 25.—*Swartz Creek*.

First mosquitoes noticed June 3. Frost during night, June 13. Wind storm from west, 192 miles in 6 hours, June 18. Grand River very high for time of year; yards and basements on low lands in vicinity of river flooded, June 19. June has been a cloudy month, with much more than the usual amount of rain. The rainfall of this month (9.91 inches) exceeds the average for June in the five years, 1879-83, at this station by 4.47 inches, and the average for 17 years at the Michigan Agricultural College by 6.03 inches.—*Lansing*.

## JULY.

Catalpa in blossom July 2; oats, July 10; linden, July 17; corn in tassel July 24; in silk July 28; wheat, June 5; cherries (Early Richmond) ripe July 4; currants (Red) ripe July 15.—*Ionia*.

With the exception of the last week July, like May and June, has been a wet month, 15 rainy days. Hay is considerably injured, and wheat harvest delayed. As the month closes cutting is half done. None of any amount yet drawn in. Oats are lodged by the wind and rain to a large extent. Potatoes are rotting in some places, but it is too early to say if this will be general. Red wheat is plump and good; Clawson wheat is shrunk. A singular thing about July is that for all the heavy



storms, there have been no great oscillations of the barometer, 29.13 observed at 2 P. M. of the 22d; with heavy (1.09 in.) rainfall.—*Thornville*.

Light frost night of July 8. Wheat is injured in many localities by blight. The heads look red or brown, and on examination the upper part of the head is found empty or filled with shrunken grain. The loss from this cause must be serious. Late wheat is rusting. All farm work is behind, and the loss to agriculture by reason of the excessive rains of the past two months must prove great. Many farmers have not been able to cultivate their corn at the proper time, and now the care of this crop and the cutting of hay and grain all demand attention at once. Clover is rotting in places, and the crops on all low grounds are partially or wholly under water, July 12. Heavy thunder storm in early morning, July 20. Very heavy thunder storm in evening, July 21. Very heavy thunder storm, 5 A. M. to 9 A. M. Total precipitation of the 12 hours preceding 9 A. M., 4.07 inches; the greatest rainfall of years. In parts of the city the storm drains proved inadequate to carry off the water. Basements and cellars are flooded from one to two feet deep, and there are many washouts. The total rainfall from 12 M. of July 20 to 12 M. July 22 (48 hours) is 5.75 inches—July 23, 11:50 A. M., appearance of a heavy storm on S. W. horizon; nimbus clouds moving from S. E. to N. W.; surface wind blowing from N. W. At this hour a tornado swept through the south part of Eaton and Ingham counties, beginning in the vicinity of Eaton Rapids, moving southeasterly a distance of about 10 miles, and lifting in the vicinity of Leslie. Three persons were killed, two injured, and much property was destroyed. At 10 A. M. of the next day the lower and ragged cumulus clouds were moving west, while the upper clouds were moving in an opposite direction.—*Lansing*.

#### AUGUST.

August 26, frost in low grounds.—*Winfield*.

August 27, hoar frost.—*Ionia*.

August 27, frost in low places, which would have done some hurt to the corn but for the fog. August has been a cool, almost cloudless month of drought. There have been but three light rains and one cloudy day. There were 17 days that the maximum temperature was below 80°, and 16 that the minimum was below 55°. There were only two really hot days, 90° or upwards. The barometrical pressure has been high. In spite of the drought water has kept up to an average height till near the end of the month. Owing to the coolness of the nights corn is almost a failure. Oats are just harvested, and are one of the heaviest crops ever raised, and remarkably free from smut. Potatoes are good in quality, but light in yield. Wheat threshing has begun, and as far as can be told from it the average yield in this vicinity cannot exceed 8 bushels to the acre. White wheat is generally shrunk. Red wheat is plump and turns out the best.—*Thornville*.

Frost occurred Aug. 14, 15, 27.—*Alpena*.

Frost, Aug. 5, 14, 15.—*Traverse City*.

Light frosts, Aug. 14, 15.—*Escanaba*.

Aug. 27, frost severe enough to injure corn on low ground. Highest temperature Aug. 22, at 2 P. M., 92°; on the 27th, 48° at 7 A. M.—*Swartz Creek*.

Aug. 17, Mayweed and ragweed in blossom. Light frost, Aug. 25. Heavy frost, Aug. 27.—*Lansing*.

#### SEPTEMBER.

First frost of the season occurred Sept. 5. Heavy frost, Sept. 8, 9.—*Tecumseh*.

Frost, Sept. 6. White frost with ice Sept. 8.—*Mendon*.

Heavy frost, Sept. 9, 10, 26.—*Marshall*.

Frost, Sept. 9, 10.—*Kalamazoo*.

Light frosts, Sept. 5, 6, 10, 11. Heavy frost spoiling grapes, Sept. 9.—*Hillsdale*.

Frosts, Sept. 5, 6. Very heavy frost Sept. 9, 10, froze everything.—*Winfield*.

Light hoar frost, Sept. 3, 5, 6, 11, 18. Heavy frost, Sept. 9, 10, 26. Ice formed Sept. 9, 10, 26.—*Ionia*.

Frosts, Sept. 9, 10, 11, 26. Sept. has been a cool month, having had but 4 days with a maximum temperature of 80°, while there were 4 nights with a minimum temperature of 40°. Much damage was done by the frosts of 9th and 10th; the corn, which was hardly glazed, having been generally killed, besides the beans, buckwheat, garden stuff, and late planted potatoes. Wheat seeding is not finished; many farmers having waited till the rains came. Probably 20 per cent of the acreage will be sowed in October. Migration of birds: Barn swallows left about Sept. 1; Robins and blue-birds, Sept. 15.—*Thornville*.

Light frost back from lake Sept. 9, 26, 30. Frost cutting most plants, Sept. 27.—*Port Austin*.

Frosts occurred Sept. 3, 5, 10, 11, 17, 18, 19, 26, 29, 30.—*Alpena*.

Frosts, Sept. 9, 10, 27, 28, 29, 30.—*Escanaba*.

First frost, Sept. 10. Temperature of Lake Huron at this point, surface 58.7°, bottom 58.3°.—*Mackinaw*.

Frosts, Sept. 3, 5, 6, 10, 18, 26. Water froze on nights of Sept. 9, 10, 26. Temperature at 6 A. M., Sept. 9, 30°; at 6 A. M., Sept. 26, 29°. Began sowing wheat Sept. 8. Frost destroyed corn, tomatoes etc., and injured clover seed.—*Swartz Creek*.

First frost to cut down vines, on Sept. 28, 29.—*Harrisville*.  
 Killing frost, Sept. 9.—*Agricultural College, Lansing*.  
 Light frosts, Sept. 5, 11, 18. Heavy frosts, Sept. 6, 9, 10, 26. Sept. 9, ice formed one-fourth inch thick in tub exposed.—*Lansing*.

## OCTOBER.

Heavy frost, Oct. 2, 3.—*Marshall*.  
 Light hoar frosts, Oct. 5, 17. Heavy hoar frosts, Oct. 1, 3, 4, 13, 16. Ice formed, Oct. 3, 4, 13, 16, 21.  
 Ground frozen, Oct. 15, 16, 17.—*Ionia*.  
 Frosts, Oct. 1, 3, 4, 5, 15, 16, 17, 27. Maple trees dropped their leaves Oct. 20. Oct. has been a wettish month, with some wintry weather, although the average temperature is not much below normal. Barometrical pressure was noticeably high and the range very great, from 29.72 to 28.32. Few migratory birds were seen. Caterpillars were never so numerous. The corn crop is nearly secured, being very poor stuff, probably not 20 per cent of it is fit to crib. The growing wheat is small and unpromising.—*Thorville*.  
 Frost occurred Oct. 1, 2, 3, 4, 5, 7, 11, 14, 15, 16, 24, 25, 26, 27.—*Alpena*.  
 Frosts, Oct. 1 to 3, 13, 15, 20, 21, 25, 26.—*Escanaba*.  
 Frosts, Oct. 1, 3, 4, 5, 13, 16, 17, 27.—*Swartz Creek*.  
 Frosts, Oct. 4, 15, 16.—*Grand Rapids*.  
 Ice formed one-fourth inch in thickness night of Oct. 23.—*Hudson*.  
 Hoar frost, Oct. 15.—*Mackinaw City*.  
 Heavy frost, Oct. 1, 4, 14, 15, 16, 17. Light frosts, Oct. 3, 5, 7. Ice formed Oct. 14, 17.—*Lansing*.

## NOVEMBER.

Nov. 11, plowed ground frozen three-fourths of an inch deep. Nov. 12, ground frozen one and one-half inches deep. Nov. 14, turf commenced freezing.—*Hillsdale*.  
 Nov. 4, white frost. Grand River frozen over for several miles above the dam, Nov. 15.—*Winfield*.  
 Frosts, Nov. 2, 4, 7, 10, 11, 23, 25, 27, 28, 29. Ice formed Nov. 2, 4, 7, 11, 12, 13, 14, 15, 16, 17, 23, 25, 27, 28, 29. Ground frozen Nov. 7, 10, 11, 12, 13, 14, 15, 16, 17, 19, 23, 25, 27.—*Ionia*.  
 Nov. has been a dry and rather pleasant month for the season; warmer than the long average, but with a few very wintry days. Ground a little frozen as the month closes. Wheat on the ground looking very poorly.—*Thorville*.  
 Frosts occurred Nov. 4, 7, 23, 25. First ice on Grand River Nov. 16.—*Grand Haven*.  
 Frosts occurred Nov. 1, 2, 3, 4, 7, 10, 11, 15, 16, 17, 18, 19, 23, 24, 25. Melting snow on ground Nov. 13, 14, 15, 17, 18, 19, 21, 29, 30.—*Alpena*.  
 Frosts, Nov. 3, 5, 22.—*Traverse City*.  
 Frosts, Nov. 1, 2, 4, 11 to 13, 22, 23, 26 to 30.—*Escanaba*.  
 Frogs were singing Nov. 23.—*Hudson*.  
 Frosts, Nov. 2, 4, 23, 25, 27.—*Grand Rapids*.  
 Frosts, Nov. 1, 3, 7, 10, 11, 12, 16, 17, 23, 25, 27.—*Swartz Creek*.  
 Frosts, Nov. 7, 10, 11, 12, 25, 29. Ice formed Nov. 7. Ice one inch. First snow this A. M., Nov. 12. River closed during the night, Nov. 15; opened Nov. 19.—*Lansing*.

## DECEMBER.

Ground frozen, Dec. 2, 3, 4, 5, 6, 9, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31.  
 Hoar frosts, Dec. 3, 4, 5, 6, 9, 11, 12, 13, 29. Ice formed, Dec. 2, 3, 4, 5, 6, 8, 9, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31. Melting snow, Dec. 26.—*Ionia*.  
 Dec. 13, very warm day for the season; bees flying. A dry month till near the close. Mean temperature, rather above the normal. Ground frozen at end of month about 6 inches in the fields, slightly in the woods.—*Thorville*.  
 Frosts, Dec. 5, 6, 9, 11, 12.—*Grand Haven*.  
 Frosts, Dec. 4, 5, 13, 17, 19, 20, 21, 22, 24, 25, 26, 29. Melting snow on ground Dec. 1, 2, 3, 4, 5, 6, 26, 27, 28, 29, 30, 31. Ground frozen one foot deep. Navigation closed Dec. 19.—*Alpena*.  
 Frosts, Dec. 1 to 6, 8 to 31. Temperature of Green Bay at surface, 36.1°; at bottom, 35°. Navigation closed Dec. 15.—*Escanaba*.  
 Frosts, Dec. 3, 5, 6, 9, 11, 12, 13, 29.—*Swartz Creek*.  
 Melting snow on ground Dec. 1, 4, 6. Temperature of water in Manistique River, Dec. 16, 32°. Ice 4 inches thick. River froze over Dec. 15. Lake Michigan frozen one mile from shore Dec. 19; broke up Dec. 23. Frozen one mile from shore Dec. 26; broke up Dec. 29.—*Manistique*.  
 Frost, Dec. 5.—*Mackinaw City*.  
 Frosts, Dec. 3, 5, 6, 11, 12, 13, 19. River closed Dec. 15.—*Lansing*.

EXHIBIT No. 11.—*Depth of Wells; Depth of Ground above Water in Well; Temperature 1883, as reported by Meteorological Observers for the State*

STATIONS IN MICHIGAN.	JANUARY.			FEBRUARY.			MARCH.			APRIL.			MAY.		
	Depth of Well.—Ft., In.			Depth of Well.—Ft., In.			Depth of Well.—Ft., In.			Depth of Well.—Ft., In.			Depth of Well.—Ft., In.		
	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.		Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.		Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.		Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.		Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	
Marquette.....	†	---	---	†	---	---	+	---	---	* 9 10	---	37 19	---	---	---
Manistique.....	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Mackinaw City.....	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Reed City.....	18 10	47 16	---	18 10	46 16	---	18 10	46 16	---	---	---	---	18 10	46 15	---
Lexington.....	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Thornville.....	20 16 10	46 16	---	20 16 10	38 14	---	20 16 10	38 18	---	20 16 6	44 15	---	20 16 6	44 17	---
Agr'l College.....	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ionia.....	22 6 20	48 20	---	22 6 20	46 13	---	22 6 20	44 16	---	---	---	---	---	---	---
Battle Creek.....	80	46 24	---	80	29 12	---	80 50	48 13	---	80 50	50 18	---	80 48	52 16	---
Hillsdale§.....	27 24 9	47 15	---	27 24 11	49 15	---	27 17 4	50 15	---	27 18 1	46 16	---	27 18	45 15	---
Kalamazoo.....	24 22	50 13	---	24 22 6	50 20	---	24 18	49 16	---	24 20 6	50 17	---	24 18	50 18	---
Mendon.....	---	---	---	17 16	59 14	---	17 14 7	46 18	---	---	---	---	17 14 9	46 17	---
Tecumseh.....	40 37 6	50 28	---	40 37 6	50 20	---	40 35	50 23	---	40 35	50 15	---	40 35	51 18	---

\* In Lake Superior at point where observation was taken.

† No observation taken on account of lake being frozen over.

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.

## TEMPERATURE.

Compared with the average for the preceding 19 years at the Agricultural College the mean temperature in November was high, and for the months from January to October, inclusive, it was low. A comparison, by months, of temperature in 1883 with the averages for corresponding months in the preceding 19 years (1864–82) at the Agricultural College, near Lansing, is given in Exhibit 12, page 140. The average temperature, by months, for the five years, 1879–83, at Lansing, and a comparison of 1883, by months, with that average, are stated in Exhibit 13, page 140. The average annual and monthly temperature at from 12 to 22 stations for a period of seven years, 1877–83, is stated in Exhibit 14, page 141; in which is also given, by months, a comparison of 1883 with the average for 1882, and with the average for the seven years, 1877–83. By the Exhibit 14, page 141, which gives averages for many stations in Michigan, it appears that in 1883 the mean temperature in January, February, and March was much lower than in those months in 1882. It also appears that January, February, March, and May, 1883, were much colder than the average



of Water in Well, and day of observation of such temperature, in each month of the year Board of Health, and for the United States Signal Service.

JUNE.			JULY.			AUGUST.			SEPTEMBER.			OCTOBER.			NOVEMBER.			DECEMBER.		
Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.
9 10	---	49 <sup>15</sup>	9 10	---	56 <sup>16</sup>	9 10	---	57 <sup>16</sup>	9 10	---	56 <sup>15</sup>	9 10	---	47.3 <sup>16</sup>	9 10	---	38.5 <sup>15</sup>	9 10	---	34 <sup>16</sup>
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	142	10	43 <sup>16</sup>
---	---	---	---	---	---	15	12	50 <sup>15</sup>	20	14 6	53.8 <sup>15</sup>	15	11 1	48 <sup>16</sup>	---	---	---	---	---	---
18	10	46 <sup>20</sup>	18	10	48 <sup>19</sup>	25	7 6	47 <sup>16</sup>	25	6 6	47 <sup>17</sup>	18	10	48 <sup>18</sup>	18	10	47 <sup>16</sup>	18	10	48 <sup>17</sup>
---	---	---	---	---	---	---	---	---	---	---	---	13	5 8	54 <sup>16</sup>	13	4	48 <sup>16</sup>	14	3 10	44 <sup>16</sup>
20	16 5	47 <sup>16</sup>	20	16 3	48 <sup>18</sup>	20	16 3	49 <sup>16</sup>	20	16 7	49 <sup>16</sup>	20	16 9	48 <sup>15</sup>	20	16 10	44 <sup>15</sup>	20	16 10	40 <sup>16</sup>
---	---	---	---	---	---	---	---	---	---	---	---	---	---	53 <sup>+1, 6,</sup>	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
80	31	16 <sup>13</sup>	80	50 8	51 <sup>20</sup>	80	54	51 <sup>21</sup>	80	57	51 <sup>17</sup>	80	---	49 <sup>21</sup>	80	77 2	50 <sup>22</sup>	80	75 1	46 <sup>19</sup>
27	18	46 <sup>15</sup>	27	18 8	46 <sup>15</sup>	27	19 3	48 <sup>15</sup>	27	20 7	49 <sup>15</sup>	27	21 8	48 <sup>16</sup>	27	22 5	48 <sup>15</sup>	27	22 3	47 <sup>15</sup>
24	21 6	50 <sup>15</sup>	24	22	51 <sup>15</sup>	24	23	51 <sup>15</sup>	24	19	51 <sup>18</sup>	24	19	51 <sup>20</sup>	24	19	52 <sup>20</sup>	24	21	50 <sup>20</sup>
---	---	---	17	14 3	49 <sup>15</sup>	---	---	---	17	15 3	51 <sup>14</sup>	---	---	---	---	---	---	---	---	---
40	35	51 <sup>13</sup>	40	36	51 <sup>16</sup>	40	37 6	51 <sup>18</sup>	40	36	51	40	37	51 <sup>20</sup>	40	37	50 <sup>18</sup>	40	37	50 <sup>20</sup>

‡ In Cedar River near the Agricultural College where the observation was taken.

§ ITEM ON MR. F. D. PARMELEE'S REGISTER FOR FEBRUARY.—Feb. 17, water in well has risen four feet five inches during the last forty-eight hours; well is on a hill about thirty feet above the river. Feb. 25, water in well raised one foot six inches since the 17th, making a total rise of five feet eleven inches since the 15th.

temperature of the corresponding months for the seven years, 1877-83, and November, 1883, warmer than the average November temperature for those seven years.

By Exhibit 15, page 144, it appears that, at the Agricultural College, the lowest temperature reached in January, February, and March, 1883, was considerably below the average lowest temperature for the preceding ten years, and that in February, 1883, the range of temperature was much greater than the average range of temperature for the corresponding month of the ten preceding years, and also the highest and lowest temperatures for 1883 were below the average highest and lowest for those years. The highest and the lowest temperatures at the Agricultural College in every month of the 11 years, 1873-83, and comparisons of months in 1883 with the average highest and lowest temperatures by months for the preceding ten years, are stated in Exhibit 15, page 144.

The average temperature at each of 21 stations in Michigan, and the average for 19 of these stations in 1883, and in each month of that year, are stated in

Table I., page 142; 7 of the lines in this table are represented in Diagram I., page 143. The average daily range of temperature at from 6 to 17 stations per year, by months, for a period of five years, 1879-83, and a comparison of 1883 with the monthly averages for that period and for 1882, are given in Exhibit 16, page 145. The highest and lowest temperatures in every month in 1883, at each of 22 stations, are stated in Table II., pages 146-7. The average daily range of temperature by months in 1883, at each of 16 stations, and the average for the 16 stations, are stated in Table III., page 149. The lines for 10 of these stations are represented in Diagram II., page 148. It will be noticed that the greatest average daily range occurred during the month of September.

**EXHIBIT 12.**—*Comparison of the Average Temperature during the Year and during each Month of the Year 1883, with the Annual and with the Monthly Averages for the Year 1882, and with the Averages for the Nineteen Years, 1864-1882. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

YEARS, ETC.	AVERAGE (MEAN) TEMPERATURE.—DEGREES FAHR.												
	Annua l Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 19 yrs., 1864-82.....	46.85	22.85	24.83	31.96	45.83	58.55	67.93	71.77	69.35	60.36	48.44	35.18	25.45
1882.....	47.57	24.89	35.12	35.96	44.70	52.73	66.49	67.71	69.52	59.98	52.67	36.30	24.80
1883.....	43.52	14.39	19.76	24.89	43.48	52.98	65.87	68.94	64.90	56.43	46.17	38.08	26.39
In 1883 <b>High- er</b> than Av. 19 yrs.—1864-82....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.90	.94
In 1883 <b>Lower</b> than Av. 19 yrs.—1864-82....	3.33	8.46	5.07	7.07	2.35	5.57	2.06	2.83	4.45	3.93	2.27	-----	-----
In 1883 <b>High- er</b> than in 1882 In 1883 <b>Lower</b> than in 1882....	-----	-----	-----	-----	-----	.25	-----	1.23	-----	-----	-----	1.78	1.59
	4.05	10.50	15.36	11.07	1.22	-----	.62	-----	4.62	3.55	6.50	-----	-----

**EXHIBIT 13.**—*Average Temperature, by Year and Months, for the five Years, 1879-83. Observations made at Office State Board of Health, State Capitol, Lansing, Michigan.*

YEARS, ETC.	AVERAGE TEMPERATURE.—DEGREES FAHR.												
	Annua l Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 yrs. 1879-83.....	48.46	23.65	26.87	33.05	45.90	59.94	67.40	73.19	70.96	62.74	53.14	36.97	27.80
1882.....	49.23	25.65	35.88	36.14	44.83	53.10	66.86	72.57	71.34	63.64	55.63	39.00	26.13
1883.....	45.69	17.01	22.07	28.04	46.42	53.28	66.98	70.42	67.78	59.42	48.31	40.09	28.47
In 1883 <b>High- er</b> than Av. for 5 yrs.—1879-83.....	-----	-----	-----	-----	.52	-----	-----	-----	-----	-----	-----	3.12	.67
In 1883 <b>Lower</b> than Av. for 5 yrs.—1879-83....	2.77	6.64	4.80	5.01	-----	6.66	.42	2.77	3.18	3.32	4.83	-----	-----
In 1883 <b>High- er</b> than in 1882 In 1883 <b>Lower</b> than in 1882....	3.54	8.64	13.81	8.10	-----	-----	-----	2.15	2.56	4.22	7.92	-----	-----

EXHIBIT 14.—Average Temperature, by Year and Months, in 1883, compared with Annual and Monthly Averages for the seven Years, 1877-1883. Averages for many Stations in Michigan.\*

YEARS, ETC.	AVERAGE TEMPERATURE.—DEGREES FAHR.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 7 years— 1877-83*-----	47.02	22.37	26.26	31.37	44.83	56.91	65.32	71.25	69.25	61.67	51.31	36.20	27.60
Av. 5 years— 1879-83-----	46.25	21.99	24.36	30.44	42.97	57.09	64.92	70.44	66.66	60.78	51.25	35.49	26.74
1882 — (22 sta- tions)-----	47.14	24.32	33.42	34.12	42.65	51.04	64.43	67.84	69.05	61.70	53.53	37.90	25.72
1883 — (19 sta- tions)-----	43.52	15.78	20.03	24.63	43.00	51.37	64.73	68.36	65.41	57.24	46.73	33.10	26.89
In 1883 <b>High-</b> <b>er</b> than Av. 7 yrs.—1877-83-----												1.90	
In 1883 <b>Lower</b> <b>than</b> Av. 7 yrs. —1877-83-----	3.50	6.59	6.23	6.74	1.83	5.54	.59	2.89	3.84	4.43	4.58	-----	.71

\*NOTE.—The stations represented in the lines for average temperature for the years 1877-83 in Exhibit 14 above, are the following: Thornville, Kalamazoo, Tecumseh, and Detroit, for each of the 7 years, 1877-83; Mendon for each of the 6 years, 1877-82; Battle Creek for the 4 years, 1877-80, and for 1882; Nirvana for 1877-79, and for the first 4 months of 1880; Reed City for the last 8 months of 1880, and for 1881-83; Coldwater, Ypsilanti, and Woodmere Cemetery (near Detroit) for 1877-79; Otisville for the 3 years, 1878-80, and for 1882-3; Niles for 1878-79 and for 1881; Marquette, Alpena, Grand Haven, Port Huron, Lansing, and Washington for the 5 years, 1879-83; Benton Harbor for the 2 years, 1877-78; Agricultural College (near Lansing) for 1877 and for the 3 years, 1881-83; Petoskey for 1878-79; Escanaba for the 4 years, 1880-83; Harrisville for the 2 years, 1881-82; Ann Arbor for the 3 years, 1881-83; Parkville for 1881 and 1882; Traverse City, Hillsdale, and Marshall for 1882-83; Winfield for 1881 and 1883; Hudson and Mallory Lake for 1881; and Ionia for 1883.

The lines for 6 representative stations in Table I. are graphically represented in Diagram I., page 143.



TABLE I.—Average Temperature in Degrees Fahr., for the Year, and for each Month of the Year 1883, at each of 21 Stations in Michigan, and also the Average for 19 of the same Stations. From Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,\* by Observers † for the State Board of Health, and for the U. S. Signal Service.

STATIONS IN MICHIGAN.†	DIVISION OF THE STATE.†	TEMPERATURE, IN DEGREES FAHR.													
		YEAR.	MONTHS,† 1883.												
			Norm. 	1883.	Jan.	Feb.	Mar.	Apr.	May.	J'ne.	J'ly.	Aug.	Sep.	Oct.	Nov.
Av. for 19 stat'ns§	-----	-----	43.52	15.73	20.03	24.63	43.00	51.37	64.73	68.36	65.41	57.24	46.73	38.10	26.89
		<sup>19</sup> -----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Marquette.....	U. P.	42.22 <sup>12</sup>	38.12	12.30	15.00	17.90	36.60	43.98	57.30	62.00	61.90	53.90	43.00	32.40	21.10
Escanaba.....	U. P.	40.72 <sup>12</sup>	37.92	9.00	12.40	17.40	36.20	45.10	59.40	63.80	61.90	53.30	43.80	32.60	20.10
Traverse City...	N. W.	41.32 <sup>11</sup>	41.32	16.39	17.57	18.25	39.51	43.61	62.32	66.42	64.70	55.88	44.74	35.86	25.58
Alpena.....	N. E.	41.60 <sup>12</sup>	38.70	14.30	16.10	18.40	35.10	44.70	58.70	63.20	61.70	52.80	42.70	33.50	23.20
Grand Haven...	W.	47.02 <sup>6</sup>	44.70	20.40	23.60	27.30	44.50	50.60	62.10	67.40	64.50	57.00	47.60	40.80	30.60
Reed City.....	W.	45.03	41.40	13.84 <sub>b</sub>	16.86 <sub>e</sub>	20.82	43.31 <sub>b</sub>	50.77 <sub>c</sub>	65.71 <sub>d</sub>	67.85 <sub>e</sub>	63.74 <sub>h</sub>	55.17 <sub>a</sub>	40.09 <sub>c</sub>	34.44 <sub>d</sub>	24.18 <sub>a</sub>
Port Austin.....	B.&E.	----- <sup>9</sup>	42.41	16.24	19.60	22.39	38.54	48.94	63.30	65.33	65.65	56.68	46.51	38.68	27.06
Port Huron.....	B.&E.	45.44 <sup>7</sup>	42.70	16.90	20.20	23.60	40.00	48.50	63.10	65.90	64.80	56.50	47.00	38.80	27.10
Thornville.....	B.&E.	48.18 <sup>20</sup>	45.78	16.99	21.43	25.80	45.44	54.75	68.66	71.39	68.16	59.56	48.61	40.27	28.28
Agr'l College...	C.	46.68 <sup>1</sup>	43.52	14.39	19.76	24.89	43.48	52.98	65.87	68.94	64.90	56.43	46.17	38.08	26.39
Ionia.....	C.	43.81 <sup>5</sup>	43.81	15.34	20.35	25.03	44.39	53.00	65.40	68.09	64.66	56.66	46.80	38.09	27.32
Lansing.....	C.	48.46 <sup>3</sup>	45.69	17.01	22.07	28.04	46.42	53.28	66.98	70.42	67.78	59.42	48.31	40.09	28.47
Winfield.....	C.	46.79 <sup>2</sup>	44.43	14.57	19.79	26.65	44.39	53.65	67.04 <sub>b</sub>	70.61	66.02	57.49 <sub>a</sub>	47.19	38.29	26.94
Ann Arbor.....	S. C.	46.54 <sup>1</sup>	44.37	15.30	20.80	26.10 <sub>b</sub>	43.90	52.70 <sub>b</sub>	65.70	69.20	65.80	58.70	47.80 <sub>a</sub>	38.90	27.50 <sub>b</sub>
Battle Creek....	S. C.	47.71 <sup>1</sup>	47.71	19.94	25.50	30.75	47.57	54.68	63.79	72.67	69.88	60.19	48.77	41.80	31.99 <sub>d</sub>
Hillsdale.....	S. C.	45.25 <sup>7</sup>	45.25	15.85	21.79	27.40	45.26	54.24	66.73	70.63	66.14	58.52	48.45	39.93	28.07
Kalamazoo.....	S. C.	48.11 <sup>1</sup>	45.63	16.32	21.43	28.73	46.91	54.61	66.02	70.43	66.72	59.51	48.35	39.66	28.80
Marshall.....	S. C.	46.77 <sup>7</sup>	46.77	17.34	23.09	29.94	47.07	55.18	67.96	71.62 <sub>f</sub>	68.60	60.43	49.85	40.71	29.43
Tecumseh.....	S. C.	47.74 <sup>12</sup>	45.22	15.84	21.71	26.81	44.59 <sub>b</sub>	53.55	67.38	70.48	66.98	58.40 <sub>b</sub>	49.26	39.70	27.89
Detroit.....	S. E.	48.28 <sup>5</sup>	47.73	21.70	26.20	30.10	46.30	54.00	67.90	71.00	67.70	59.70	50.80	43.80	33.50
Washington.....	S. E.	46.07	43.87	16.02	20.44	24.76	43.14	51.78	65.60	68.81	66.06	58.13	47.39	37.93	26.37

a, b, c In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days.

f For 25 days. g For 24 days. h For 23 days.

\* At the U. S. Signal Service Stations for the year 1883, the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time, and one-third the sum of the three observations was taken as the daily average. The local time at these stations corresponding to 7 A. M., 3 P. M., and 11 P. M., Washington time, is as follows: At Port Huron, 6:38 A. M., 2:38 P. M., and 10:38 P. M.; at Detroit, 6:36 A. M., 2:36 P. M., and 10:36 P. M.; at Alpena, 6:34 A. M., 2:34 P. M., and 10:34 P. M.; at Grand Haven, 6:23 A. M., 2:23 P. M., and 10:23 P. M.; at Escanaba, 6:20 A. M., 2:20 P. M., and 10:20 P. M.; at Marquette, 6:19 A. M., 2:19 P. M., and 10:19 P. M. At the other stations the observations were made at 7 A. M., 2 P. M., and 9 P. M., local time; and the daily averages were one-third the sum of these three observations.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 8, page 130.

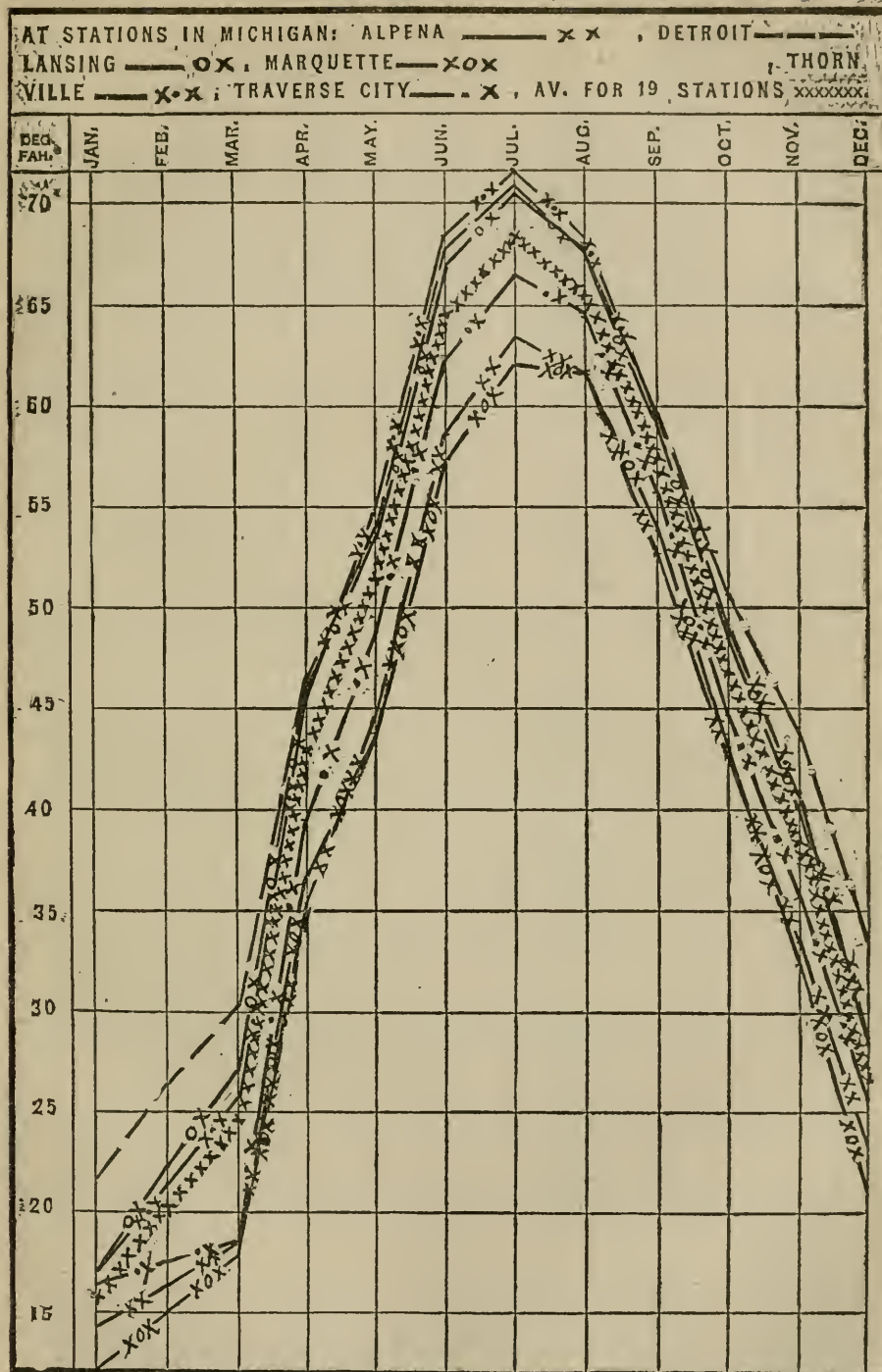
‡ The names of divisions, and the counties in each are stated in Exhibit 1, page 59.

§ This line is an average for only the 19 stations from which statements nearly complete were received for every month of the year. It does not include Battle Creek or Port Austin.

|| Numbers in this column state the average annual temperature for periods of years ending in each case with Dec. 31, 1883. The small figures above and at the right of numbers which state the temperature, denote the number of years included in the average.

¶ The computations of Av. Temp., as tabulated for months in 1883, were made at the following stations: Marquette, Escanaba, Grand Haven, Detroit, Ann Arbor, Alpena, Port Huron, and Ionia. All other computations in Table I. were made at the office of the State Board of Health.

DIAGRAM I.—AVERAGE TEMPERATURE, BY MONTHS IN 1883.



SCALE, 10° F. TO 1.07 IN. VERTICALLY.

DES. BY H. B. E.

EXHIBIT 15.—Comparisons of the Extremes and the Range of Temperature (Degrees Fahr.) during the Year, and during each month of the Year 1883, with the Average of the Extremes, and of the Range, for the Ten Years, 1873-82; also, Statement of the Extremes and of the Range for each of the Ten Years, 1873-82. Observations made with Registering Thermometers (except for the first two months of 1873, and for those two months with an ordinary Thermometer, at 7 A. M., 2 P. M., and 9 P. M.) Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich. For Nov. and Dec., 1879, the observations were made by Harry B. Turner, at the Office of the State Board of Health, Lansing.

EXTREMES AND RANGES OF TEMPERATURE.—DEGREES F.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
YEAR AND MONTHS.	1873.		1874.		1875.		1876.		1877.		1878.		1879.		1880.		1881.		1882.		Av. for 10 years, 1873-82.*		1883.*		'83 High (+), or Lower (-), than Av. 10 yrs., 1873-82.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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Year .....	94	-30	124	101	-7	108	94	-33	127	96	-19	115	93	-14	107	98	-7	105	97	-18	115	94	-17	111	100	-17	117	89	-10	99	96	-17	113	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	111	91	-20	



EXHIBIT 16.—Average Daily Range of Temperature, by Year and Months in 1883, compared with Annual and Monthly Averages for the 5 Years, 1879-83. \*These Averages are for Groups of several Stations in Michigan.\*

YEARS, ETC.	AVERAGE DAILY RANGE OF TEMPERATURE.—DEGREES FAHR.												
	Annua- l Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 5 years, 1879-83*.....	18.00	16.46	17.54	17.22	19.55	21.12	19.66	19.63	19.85	19.55	17.33	14.91	13.15
1882—(17 sta- tions*).....	17.43	15.70	16.52	15.89	19.08	19.55	20.33	20.25	16.80	19.31	19.77	13.51	12.43
1883—(16 sta- tions*).....	19.13	17.64	18.38	21.44	19.64	20.21	19.13	19.06	22.65	23.95	15.70	16.24	15.44
In 1883 <b>Great- er</b> than Av. 5 yrs.—1879-83.....	1.13	1.18	.84	4.22	.09	-----	-----	-----	2.80	4.40	-----	1.43	2.29
In 1883 <b>Less</b> than Av. 5 yrs. —1879-83.....	-----	-----	-----	-----	-----	.91	.53	.57	-----	-----	1.63	-----	-----
In 1883 <b>Great- er</b> than in 1882	1.70	1.94	1.86	5.55	.56	.66	-----	-----	5.85	4.64	-----	2.83	-----
In 1883 <b>Less</b> than in 1882.....	-----	-----	-----	-----	-----	-----	1.20	1.19	-----	-----	4.07	-----	3.01

\* Marquette, Grand Haven, Lansing, and Detroit for each of the 5 years, 1879-83; Otisville for 1879, 1880, and 1882; Battle Creek for 1879 and 1880; Escanaba, Alpena, Port Huron, Thornville, and Kalamazoo for each of the 4 years, 1880-83; Adrian for 1880; Agricultural College for the 3 years, 1881-83; Traverse City for 1882 and 1883; Harrisville and Reed City for 1882; Ann Arbor, Marshall, and Washington for 1882 and 1883; Winfield and Tecumseh for 1883.

EXHIBIT 17.—Comparisons of the Average Daily Range of Temperature for the Year and for each Month of the Year 1883, with Averages for the 9 Years, 1874-82, and for the Year 1882. Observations made with Registering Thermometers by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.

YEARS, ETC.	AVERAGE DAILY RANGE OF TEMPERATURE.—DEGREES FAHR.												
	Annua- l Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 9 yrs. 1874- 82*-----	21.36	16.82	19.30	19.04	23.24	25.80	23.85	25.63	26.40	24.51	20.89	16.05	14.76
1882-----	19.39	16.80	18.93	18.16	20.27	21.35	20.20	20.87	19.54	22.70	24.23	16.17	13.45
1883-----	20.42	17.90	19.00	21.81	21.83	22.19	19.83	19.42	25.90	25.70	18.06	17.90	15.52
In 1883 <b>Great- er</b> than Av. for 1874-82-----	-----	1.03	-----	2.77	-----	-----	-----	-----	-----	1.19	-----	1.85	.76
In 1883 <b>Less</b> than Av. for 1874-82-----	.94	-----	.30	-----	1.41	3.61	4.02	6.21	.50	-----	2.83	-----	-----
In 1883 <b>Great- er</b> than in 1882	1.03	1.10	.07	3.65	1.56	.84	-----	-----	6.36	3.00	-----	1.73	2.07
In 1883 <b>Less</b> than in 1882-----	-----	-----	-----	-----	-----	-----	.37	1.45	-----	-----	6.17	-----	-----

\* For the years 1874-6, 1878, 1879 (except Nov. and Dec.), and 1880, the computations were made from the report of observations published in the Reports of the State Board of Agriculture for those years. For 1877, 1881 (except Jan.), 1882, and 1883, the computations were made from registers or copies of registers supplied by Dr. Kedzie.

TABLE II.—*Extremes of Temperature and Days of Month on which the Highest and for the Year 1883, at each of 22 Stations in Michigan.—As indicated by Daily Readings P. M., by many Observers\* for the State Board of Health, and for the U. S. Signal Service.*

Line Number.	STATIONS IN MICHIGAN,* (Those of the U. S. Signal Service in Italics.)	YEAR 1883.			JANUARY.		FEBRUARY.		MARCH.		APRIL.		MAY.	
		Highest.	Lowest.	Range.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1	At 22 Stations.	99	-28	127	50	-28	57	-28	69	-20	87	2	84	22
2	Marquette.....†	94	-20	114	30 32	22 -20	21 38	9 -17	1 48	19 -13	14 63	1 8	17,19 72	13,16 28
3	Escanaba.....†	82	-24	106	32 30	-22 22	37 16	-24 9	52 1,14	-15 4	56 14	2 1	70 24	27 13
4	Traverse City.†	88	-14	102	36 13	-14 26	46 16	-12 10	47 1	-12 8,20,22	78 9,15	5 1	80 25	27 1
5	Alpena.....†	87	-22	109	38 30	-22 26	50 16	-15 10	55 18	-8 19	65 14	2 2	71 18	22 1
6	Grand Haven.†	81	-20	101	40 29	-10 22	54 16,17	-20 9	46 1	1 19	80 14	21 1	76 25	34 12
7	Reed City.....†	92	-28	120	38 13	-28 24,25	52 16	-28 9	51 14	-20 20	81 14	5 1	83 19	23 21
8	Port Austin...†	88	-10	98	35 30	-10 22	46 16	-9 10	50 14	-1 8	87 14	13 2	79 19	36 21
9	Port Huron....†	89	-15	104	42 30	-15 22	51 16	-7 10	55 14	-6 20	81 14	15 2	78 19	32 1,13
10	Thornville.....†	94	-18	112	42 20	-14 21	50 16	-18 9	68 14	-14 7,19	84 14	18 1	84 19	34 13,21
11	Agr'l College..†	91	-20	111	41 30	-19 2	50 16	-20 10	52 11	-8 8	83 14	14 2	80 19	31 21
12	Ionia.....†	94	-22	116	36 30	-22 21,22	46 16	-14 9	51 14	0 7	83 14	20 1	78 19	35 20
13	Lansing.....†	92	-19	111	40 30	-19 21,22	51 16	-12 9	59 14	-4 19	85 14	17 1	80 25	33 12
14	Winfield.....†	99	-23	122	43 30	-21 22	49 16	-23 6	56 14	-8 20	84 14	15 2	81 19	28 23
15	Ann Arbor.....†	90	-19	109	41 39	-19 26	52 16	-6 10	57 14	-3 19	84 18	16 1	79 19,25	31 21
16	Battle Creek..†	88	-12	100	45 26	-12 21	53 16	-3 9	55 16	6 19	70 14	23 1	72 19	31 12
17	Hillsdale.....†	90	-19	109	44 26	-19 22	52 15	-7 5	59 11	-4 7	82 14	17 1	79 19	28 10
18	Kalamazoo.....†	93	-18	111	39 20	-18 21	52 15,16	-6 9	56 14	4 20	85 11	22 1	79 19,25	35 12
19	Marshall.....†	94	-19	113	39 5	-19 21	50 16	-8 5,10	57 14	2 7	82 17	20 1	80 19	32 12
20	Mendon.....†	96	-17	113	46 20	-17 21	52 16	-6 9	69 18	4 19	71 14	21 1	81 19,25	31 12
21	Tecumseh.....†	92	-19	111	42 33	-19 22	51 16	-11 6	59 14	-12 20	85 14	18 1	80 19	28 21,22
22	Detroit.....†	91	-8	99	50 31	-8 25	57 17	6 10	58 13	3 20	78 15	18 2	77 20	33 14
23	Washington...†	51	-20	111	43	-20	49	-12	55	-10	84	18	82	29

NOTE.—The small figures above and at the right of numbers denoting the degrees of temperature state the day or days of the month on which the highest or the lowest temperature occurred.

\* The names of observers, etc., are stated in Exhibit 8, page 130.

† The extremes for Battle Creek for months February to December, inclusive; also Ionia, January to June; Port Austin, January to December, and the maximum temperature for Reed City, August to December, were determined from readings of the dry bulb of the psychrometer at 7 A. M., 2 P. M., and 9 P. M.

*the Lowest Temperature occurred, by Months of the Year 1883; also Extremes and Range of Registering Thermometers, or by Observations made Daily at 7 A. M., 2 P. M., and 9*

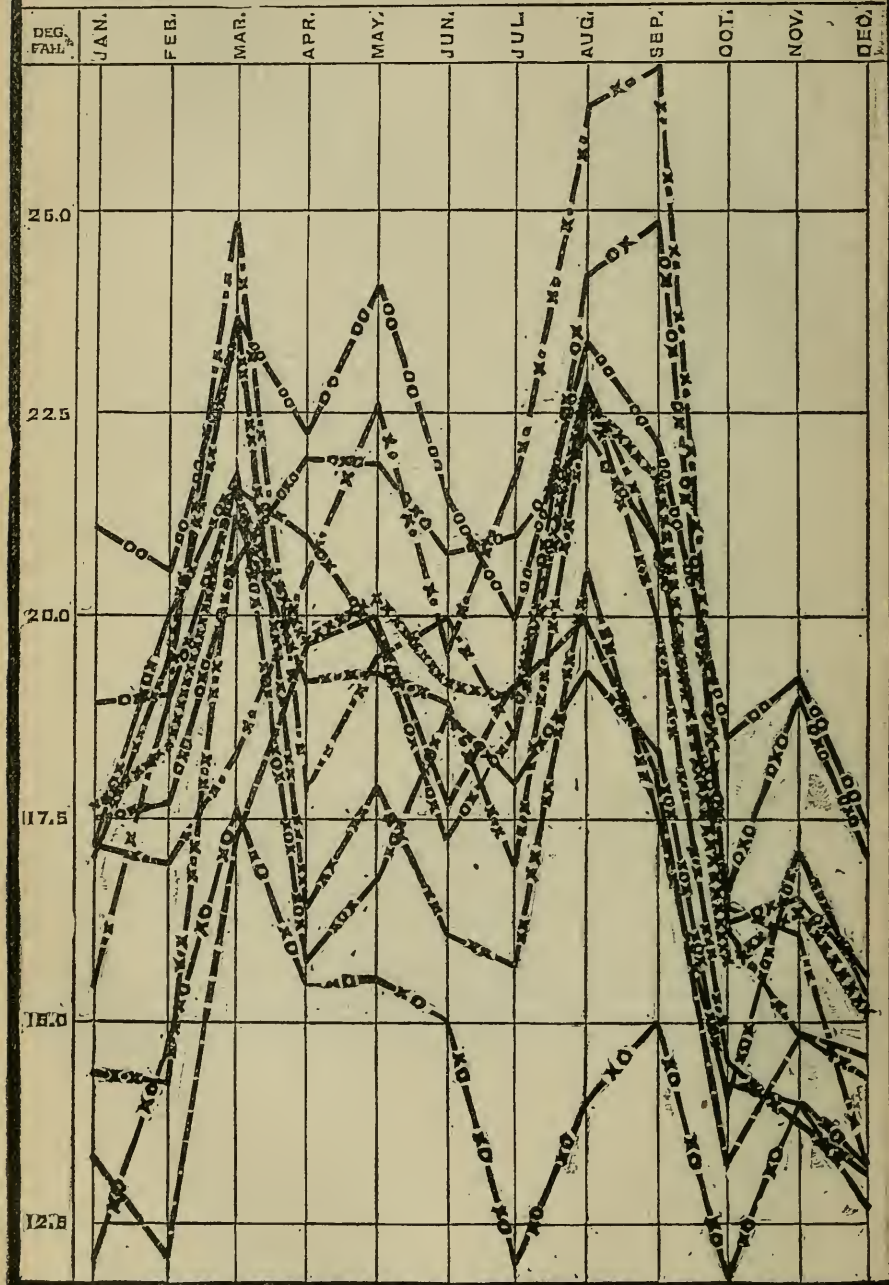
JUNE.		JULY.		AUGUST.		SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.		Line Number.
Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	
94	31	99	40	97	32	95	25	84	21	68	-3	59	-12	1
<sup>23</sup> 40	<sup>3,9,10,11</sup> 31	<sup>1</sup> 94	<sup>13</sup> 40	<sup>21</sup> 88	<sup>19</sup> 35	<sup>14</sup> 82	<sup>29</sup> 28	<sup>18</sup> 66	<sup>21</sup> 24	<sup>4</sup> 57	<sup>16</sup> 1	<sup>7</sup> 53	<sup>19</sup> -12	2
<sup>28</sup> 43	<sup>10</sup> 31	<sup>1,2</sup> 94	<sup>13</sup> 40	<sup>18,25</sup> 88	<sup>14</sup> 35	<sup>1</sup> 82	<sup>29</sup> 28	<sup>9</sup> 66	<sup>20</sup> 24	<sup>6</sup> 57	<sup>16</sup> 1	<sup>7</sup> 53	<sup>19</sup> -12	3
<sup>16</sup> 45	<sup>4,7</sup> 31	<sup>1</sup> 94	<sup>19</sup> 40	<sup>19,21</sup> 88	<sup>26</sup> 35	<sup>1</sup> 82	<sup>29</sup> 28	<sup>28,30</sup> 66	<sup>8</sup> 24	<sup>5</sup> 57	<sup>15</sup> 1	<sup>15</sup> 53	<sup>22</sup> -9	4
<sup>16,18</sup> 45	<sup>1</sup> 31	<sup>1</sup> 94	<sup>9</sup> 40	<sup>22</sup> 88	<sup>15,27</sup> 35	<sup>6</sup> 82	<sup>30</sup> 29	<sup>9</sup> 66	<sup>24</sup> 24	<sup>5,6</sup> 60	<sup>16</sup> 9	<sup>16</sup> 54	<sup>22</sup> -4	5
<sup>23</sup> 41	<sup>1</sup> 31	<sup>3</sup> 94	<sup>9</sup> 40	<sup>19</sup> 87	<sup>27</sup> 34	<sup>15</sup> 83	<sup>29</sup> 29	<sup>8</sup> 74	<sup>26</sup> 26	<sup>26</sup> 57	<sup>16</sup> 2	<sup>16</sup> 52	<sup>23</sup> 0	6
<sup>17,23</sup> 41	<sup>1</sup> 31	<sup>3</sup> 94	<sup>8,19</sup> 52	<sup>17,19</sup> 81	<sup>5</sup> 45	<sup>15</sup> 37	<sup>29</sup> 37	<sup>8,9</sup> 73	<sup>29</sup> 29	<sup>5</sup> 61	<sup>15</sup> 15	<sup>10,13</sup> 55	<sup>22</sup> 10	7
<sup>24</sup> 31	<sup>2</sup> 31	<sup>13</sup> 92	<sup>1</sup> 42	<sup>26</sup> 86	<sup>27</sup> 34	<sup>1</sup> 83	<sup>30</sup> 25	<sup>16,17</sup> 68	<sup>21</sup> 3,16	<sup>5,21</sup> 56	<sup>15</sup> -8	<sup>15</sup> 46	<sup>22</sup> -8	8
<sup>17</sup> 45	<sup>1</sup> 31	<sup>4</sup> 88	<sup>9</sup> 48	<sup>22</sup> 80	<sup>27</sup> 54	<sup>15</sup> 76	<sup>26</sup> 37	<sup>9</sup> 75	<sup>21</sup> 33	<sup>5</sup> 58	<sup>16</sup> 12	<sup>16</sup> 58	<sup>28</sup> 10	9
<sup>17</sup> 41	<sup>1</sup> 31	<sup>7</sup> 87	<sup>9</sup> 49	<sup>22</sup> 89	<sup>27</sup> 48	<sup>15</sup> 83	<sup>26</sup> 35	<sup>9</sup> 79	<sup>21</sup> 30	<sup>5</sup> 64	<sup>16</sup> 8	<sup>16</sup> 53	<sup>28</sup> 1	10
<sup>17</sup> 40	<sup>13</sup> 31	<sup>3</sup> 91	<sup>8</sup> 47	<sup>22</sup> 94	<sup>26</sup> 42	<sup>15</sup> 85	<sup>26</sup> 34	<sup>9</sup> 80	<sup>21</sup> 20	<sup>21</sup> 65	<sup>15,16</sup> 6	<sup>15</sup> 56	<sup>29</sup> 4	11
<sup>17</sup> 42	<sup>1</sup> 31	<sup>16</sup> 90	<sup>18</sup> 45	<sup>22</sup> 91	<sup>26</sup> 32	<sup>15</sup> 86	<sup>28</sup> 77	<sup>9</sup> 22	<sup>15</sup> 63	<sup>5</sup> 63	<sup>15</sup> 7	<sup>15</sup> 55	<sup>29,31</sup> -2	12
<sup>17</sup> 46	<sup>13</sup> 31	<sup>3</sup> 86	<sup>8</sup> 50	<sup>22</sup> 94	<sup>26</sup> 37	<sup>15</sup> 88	<sup>28</sup> 78	<sup>9</sup> 26	<sup>15</sup> 62	<sup>5</sup> 62	<sup>15</sup> 5	<sup>15</sup> 58	<sup>29</sup> 1	13
<sup>17,29</sup> 46	<sup>1</sup> 31	<sup>3</sup> 90	<sup>8</sup> 50	<sup>22</sup> 92	<sup>26</sup> 43	<sup>15</sup> 89	<sup>28</sup> 78	<sup>9</sup> 30	<sup>15</sup> 64	<sup>5,8,21</sup> 64	<sup>15</sup> 9	<sup>15</sup> 56	<sup>29</sup> 2	14
<sup>17</sup> 38	<sup>1</sup> 31	<sup>3</sup> 99	<sup>9</sup> 42	<sup>22</sup> 97	<sup>26</sup> 37	<sup>15</sup> 92	<sup>25</sup> 83	<sup>21</sup> 25	<sup>15</sup> 62	<sup>5</sup> 62	<sup>15</sup> 7	<sup>15</sup> 56	<sup>29</sup> -5	15
<sup>17</sup> 37	<sup>1,7,10</sup> 31	<sup>6</sup> 88	<sup>29</sup> 46	<sup>19</sup> 90	<sup>2</sup> 46	<sup>15</sup> 83	<sup>28</sup> 80	<sup>9</sup> 29	<sup>20</sup> 29	<sup>21</sup> 64	<sup>16</sup> 8	<sup>16</sup> 54	<sup>29</sup> 2	16
<sup>17</sup> 58	<sup>13</sup> 31	<sup>8</sup> 88	<sup>4</sup> 57	<sup>22</sup> 84	<sup>26</sup> 57	<sup>15</sup> 84	<sup>25</sup> 72	<sup>9</sup> 33	<sup>15</sup> 00	<sup>6,21</sup> 20	<sup>15</sup> 20	<sup>15</sup> 55	<sup>16</sup> 11	17
<sup>16</sup> 40	<sup>13</sup> 31	<sup>2,3</sup> 89	<sup>8</sup> 43	<sup>22</sup> 90	<sup>26</sup> 42	<sup>15</sup> 85	<sup>29</sup> 80	<sup>9</sup> 25	<sup>15</sup> 63	<sup>4,8</sup> 61	<sup>15</sup> 7	<sup>15</sup> 55	<sup>29</sup> 1	18
<sup>17,23</sup> 45	<sup>1</sup> 31	<sup>3</sup> 90	<sup>8,29</sup> 50	<sup>22</sup> 93	<sup>26</sup> 46	<sup>15</sup> 90	<sup>25</sup> 75	<sup>9</sup> 31	<sup>15</sup> 61	<sup>5</sup> 61	<sup>15</sup> 14	<sup>15</sup> 59	<sup>29</sup> 7	19
<sup>22</sup> 45	<sup>13</sup> 31	<sup>3</sup> 93	<sup>29</sup> 48	<sup>22</sup> 94	<sup>26</sup> 44	<sup>15</sup> 88	<sup>25</sup> 78	<sup>9</sup> 29	<sup>15</sup> 62	<sup>8</sup> 62	<sup>14</sup> 10	<sup>14</sup> 56	<sup>29</sup> 4	20
<sup>17</sup> 40	<sup>1,13</sup> 31	<sup>3</sup> 96	<sup>8</sup> 47	<sup>22</sup> 95	<sup>26</sup> 41	<sup>15</sup> 95	<sup>30</sup> 81	<sup>9</sup> 28	<sup>15,22,26</sup> 63	<sup>5</sup> 63	<sup>15</sup> 8	<sup>15</sup> 59	<sup>29</sup> 5	21
<sup>23</sup> 40	<sup>1</sup> 31	<sup>22</sup> 92	<sup>9</sup> 45	<sup>22</sup> 91	<sup>26</sup> 42	<sup>15</sup> 89	<sup>26</sup> 84	<sup>9</sup> 28	<sup>16</sup> 66	<sup>22</sup> 66	<sup>16</sup> 8	<sup>16</sup> 56	<sup>29,33</sup> -3	22
<sup>18</sup> 46	<sup>1</sup> 31	<sup>4,5</sup> 91	<sup>9</sup> 50	<sup>23</sup> 89	<sup>27</sup> 49	<sup>16</sup> 81	<sup>26</sup> 30	<sup>10,28</sup> 78	<sup>16</sup> 34	<sup>6</sup> 67	<sup>16,17</sup> 14	<sup>14</sup> 58	<sup>29,33</sup> 11	23
86	36	88	45	91	45	82	32	83	29	66	9	54	0	23

‡ Determined by daily readings of registering thermometers made and recorded at 7 A. M., for the preceding calendar day. But at Battle Creek for January, and Washington for the whole year, the observations were recorded for the calendar day on which they were made; and at the stations of the U. S. Signal Service the registering thermometers were recorded and set each day at 11 P. M., Washington time.



# DIAGRAM II.—AV. DAILY RANGE OF TEMP. BY MOS., 1883.

BY REGIST. THERMRS. AT STATIONS IN MICH.: ALPENA—**xx**, ANN ARBOR—**oxo**, DETROIT—**—**, GRAND HAVEN—**xo**, LANSING—**ox**, MARQUETTE—**xox**, MARSHALL—**xe**, THORNVILLE—**xx**, TRAVERSE CITY—**—**, WASHINGTON, MICH.—**oo** 1<sup>st</sup> AV. FOR 16 STATIONS **xxxxxxxx**



\*SCALE: 5° F. RANGE TO 2.18 IN. VERTICALLY

H. B. T., DEL.

DES. BY H. B. B.

TABLE III.—Average Daily Range of Temperature, by Registering Thermometers, during the Year and during each Month of the Year 1883, at each of 16 Stations in Michigan, and Average for the 16 Stations.

STATIONS IN		Divisions of the State.†	Norm. ‡	AVERAGE DAILY RANGE OF TEMPERATURE.—DEGREES FAHR.											
MICHIGAN.*  (Those of the U. S. Signal Service in Italics.)	Yr., 1883.			MONTHS, 1883.											
				Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 16 sta- tions.			18.92	17.64	18.38	21.44	19.64	20.21	19.13	19.06	22.65	21.68	15.70	16.34	15.13
		<sup>5</sup>													
Marquette .....	U. P.	17.57 <sup>4</sup>	17.67	17.19	20.04	21.74	15.70	16.74	18.77	17.94	19.31	18.27	13.88	17.16	15.31
Escanaba .....	U. P.	16.47 <sup>2</sup>	18.31	21.15	21.39	26.50	17.91	16.70	17.11	17.15	19.77	18.51	13.89	16.04	13.55
Traverse City ..	N. W.	17.80 <sup>4</sup>	18.69	15.42	18.89	24.77	17.80	19.48	20.07	18.42	22.81	20.97	16.42	16.00	13.23
Alpena .....	N. E.	16.26 <sup>5</sup>	17.06	17.02	19.36	23.52	16.43	17.87	16.07	15.65	20.45	17.55	14.20	13.86	12.71
Grand Haven...	W.	13.52 <sup>4</sup>	14.19	12.06	14.66	17.62	15.33	15.47	15.02	12.01	14.05	14.98	11.78	13.98	13.22
Port Huron .....	B. & E.	15.96 <sup>4</sup>	16.57	14.94	16.75	18.09	16.19	17.43	18.17	17.98	18.86	16.45	14.10	14.96	14.89
Thornville .....	B. & E.	17.06	17.34	14.29	14.21	21.19	19.17	19.26	18.90	16.90	22.81	19.97	14.52	13.77	13.10
Agr'l College...	C.	20.42 <sup>5</sup>	20.42	17.90	19.00	21.81	21.83	22.19	19.83	19.42	25.90	25.70	18.06	17.90	15.52
Lansing .....	C.	19.00 <sup>1</sup>	19.43	18.87	19.00	21.55	20.93	19.74	17.20	18.55	24.16	24.83	16.23	16.53	15.52
Winfield .....	C.	24.37 <sup>2</sup>	24.37	25.06	23.93	23.90	24.20 <sup>b</sup>	24.77	24.93 <sup>b</sup>	26.29	31.55	30.97	19.55	18.90	18.39 <sup>c</sup>
Ann Arbor .....	S. C.	18.83 <sup>4</sup>	19.73	17.51	17.71	20.66	21.92	21.84	20.69	20.89	22.19	20.86	16.55	18.95	17.04
Kalamazoo .....	S. C.	18.62 <sup>2</sup>	18.69	17.29	18.07	17.76	21.17	21.44	17.98	19.16	23.13	24.35	14.98	14.75	14.21
Marshall .....	S. C.	19.06 <sup>1</sup>	19.55	17.16	16.89	18.26	20.40	22.61 <sup>c</sup>	19.47	21.71 <sup>a</sup>	26.26	26.70	16.03	14.80	14.26
Tecumseh .....	S. C.	22.90 <sup>5</sup>	22.90	22.03	21.54	24.81	23.43	23.74	22.77	23.86	27.81	26.53	19.35	19.77	19.16
Detroit .....	S. E.	15.60 <sup>2</sup>	16.64	13.25	12.07	17.25	19.63	20.05	17.65	19.11	20.02	18.03	13.22	14.82	14.54
Washington ....	S. E.	20.10	21.11	21.06	20.50	23.68	22.20	24.06	21.37	19.97	23.32	22.13	18.42	19.23	17.39

NOTE.—Graphic representations of statements in Table III, are given in Diagram No. II, page 148.

\* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit S, page 130.

† For counties in each division see Exhibit I, page 50.

‡ Numbers in this column state the annual average range of temperature for periods of years ending in each case with Dec. 31, 1883. The small figures above and at the right of numbers which state the range of temperature, denote the number of years included in the average.

<sup>a</sup>, <sup>b</sup>, <sup>c</sup>. In the columns from January to December, inclusive, the letters <sup>a</sup>, <sup>b</sup>, <sup>c</sup>, etc., stand directly above the numbers from which they refer to the notes below.<sup>a</sup> For 27 days.<sup>b</sup> For 29 days.<sup>c</sup> For 30 days

## ABSOLUTE HUMIDITY.

The quantity of invisible vapor of water in the air varies from several causes, but mainly with the temperature, the warmer the outdoor air the greater the amount of water it may contain, and usually the greater amount it does contain.

Exhibit 18 states the annual and monthly average at the State Agricultural College for seventeen years, and gives comparisons of 1883 with this average and with the year 1882. Exhibit 19 states the average of all stations in Michigan for a period of seven years, and compares 1883 with this average and with the year 1882. The absolute humidity at each of eighteen stations by months in 1883, is stated in table IV., page 151.

EXHIBIT 18.—*Comparison of the Average Absolute Humidity for the Year, and for each Month of the Year 1883, with averages for the 17 Years 1866-82, and for the Year 1882.—Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

YEARS, ETC.	ABSOLUTE HUMIDITY—GRAINS OF VAPOR IN A CUBIC FOOT OF AIR.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 17 yrs, '66-82	3.50	1.47	1.55	1.83	2.65	4.04	5.60	6.55	6.11	4.86	3.36	2.15	1.63
1882-----	3.60	1.72	2.11	2.18	2.72	3.48	5.51	5.57	6.66	5.04	4.00	2.47	1.74
1883-----	3.34	1.26	1.53	1.62	2.66	3.67	5.83	6.37	5.27	4.34	3.22	2.51	1.77
In 1883 <b>Great-</b> er than Av. 17 yrs, 1866-82....	-----	-----	-----	-----	.01	-----	.28	-----	-----	-----	-----	.36	.14
In 1883 <b>Less</b> than Av. 17 yrs, '66-82-----	.16	.21	.02	.26	-----	.37	-----	.18	.84	.52	.14	-----	-----
In 1883 <b>Great-</b> er than in 1882. In 1883 <b>Less</b> than in 1882....	-----	-----	-----	-----	-----	.19	.37	.80	-----	-----	-----	.04	.03
	.26	.46	.53	.56	.06	-----	-----	-----	1.39	.70	.78	-----	-----

EXHIBIT 19.—*Average Absolute Humidity, by Year and Months, in 1883, compared with Annual and Monthly Averages for the seven Years, 1877-1883.*

YEARS, ETC.	ABSOLUTE HUMIDITY—GRAINS OF VAPOR IN A CUBIC FOOT OF AIR.												
	Annua- l Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 7 yrs, '77-83*	3.51	1.46	1.62	1.89	2.77	3.98	5.32	6.23	5.97	5.00	3.80	2.34	1.79
1882 (23 stat'ns*)	3.48	1.53	2.03	2.06	2.59	3.30	5.20	5.52	6.47	5.03	3.95	2.46	1.59
1883 (18 stat'ns*)	3.17	1.11	1.29	1.39	2.55	3.44	5.45	6.02	5.20	4.31	3.22	2.43	1.66
In 1883 <b>Great-</b> er than Av. 7 yrs, '77-83.....	-----	-----	-----	-----	-----	-----	.13	-----	-----	-----	-----	.09	-----
In 1883 <b>Less</b> than Av. 7 yrs, '77-83.....	.34	.35	.33	.50	.22	.54	-----	.21	.77	.69	.58	-----	.13
In 1883 <b>Great-</b> er than in 1882. In 1883 <b>Less</b> than in 1882....	-----	-----	-----	-----	-----	.14	.25	.50	-----	-----	-----	-----	.07
	.31	.42	.74	.67	.04	-----	-----	-----	1.27	.72	.73	.03	-----

\* The stations represented in the lines for average absolute humidity in the Exhibit 19, above, are Thornville, Kalamazoo, and Detroit for the 7 years 1877-83; Mendon for the 6 years 1877-83; Tecumseh for the 6 years 1878-83; Battle Creek for the 3 years 1877-79, and for 1882; Otisville for the 3 years 1878-80, and for 1882; Marquette, Alpena, Grand Haven, Port Huron, and Lansing for the 5 years 1879-83; Agricultural College for 1877 and 1878; also for the three years 1881-1883; Niles for 1878, 1879, and 1881; Nirvana for 1878, 1879, and for the first four months of 1880; Reed City for the last eight months of 1880 and the 3 years 1881-83; Benton Harbor and Coldwater for 1877 and 1878; Escanaba and Washington for the 4 years 1880-83; Petoskey, for 1879; Winfield for 1881 and 1883; Ann Arbor for the 3 years 1881-83; Woodmere Cemetery for the three years 1877-79; Traverse City, Hillsdale, and Marshall for 1882 and 1883; and Harrisville, Hastings, and Parkville for 1882.



TABLE IV.—ABSOLUTE HUMIDITY.—*The Average Number of Grains of Vapor of Water in a Cubic Foot of Air for Months and Year 1883, at 18 Stations in Michigan,—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,\* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

STATIONS IN		GRAINS OF VAPOR IN A CUBIC FOOT OF AIR—(ABSOLUTE HUMIDITY.)														
(Those of U. S. Signal Service in Italics.)		Divisions of the State.‡	YEAR.		MONTHS, 1883.											
			Norm.	1883.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 18 stations.§				3.17	1.11	1.29	1.39	2.55	3.41	5.45	6.02	5.20	4.31	3.22	2.43	1.66
Marquette.....		U. P.	2.74 <sup>5</sup> <sub>4</sub>	2.44 <sup>f</sup>	0.75 <sup>j</sup>	0.83	1.98	2.52	3.97	4.63	4.51	3.66	2.63	1.78	1.21	
Escanaba.....		U. P.	2.93 <sup>2</sup>	2.68	0.86	0.86	0.94	2.01	2.72	4.52	5.33	4.91	3.95	2.82	1.96	1.28
Traverse City..		N. W.	3.38 <sup>6</sup> <sub>5</sub>	3.26	1.30	1.37	1.31	2.58	3.53	5.47	6.10	5.46	4.45 <sup>d</sup>	3.20	2.49	1.84 <sup>a</sup>
Alpena.....		N. E.	2.94 <sup>5</sup> <sub>4</sub>	2.70	0.92	1.03	1.01	1.96	2.82	4.60	5.12	4.66	3.93	2.79	2.14	1.36
Grand Haven...		W.	3.54 <sup>6</sup> <sub>5</sub>	3.25	1.24	1.43	1.59	2.59	3.34	5.09	5.98	5.47	4.11	3.31	2.68	1.87
Reed City.....		W.	3.15 <sup>5</sup> <sub>4</sub>	2.84	0.81	0.97	1.02	2.39	3.16	5.19	5.72	4.73	3.95	2.87	2.06	1.26
Port Huron.....		B.&E.	3.34 <sup>7</sup> <sub>6</sub>	3.16	1.19	1.36	1.43	2.52	3.28	5.26	5.86	5.27	4.28	3.25	2.55	1.68
Thornville.....		B.&E.	3.77 <sup>4</sup> <sub>3</sub>	3.52	1.35	1.50 <sup>i</sup>	1.57	2.90	3.93	6.17	6.62	5.59	4.68	3.43	2.61	1.87 <sup>b</sup>
Agr'l College...		C.	3.59 <sup>5</sup> <sub>4</sub>	3.34	1.26	1.53	1.62	2.66	3.67	5.88	6.37	5.27	4.34	3.22	2.51	1.77
Lausling.....		C.	3.42 <sup>3</sup> <sub>2</sub>	3.20	1.10 <sup>a</sup>	1.33	1.45	2.65	3.49	5.59	6.13	5.08	4.24	3.27	2.43	1.66 <sup>a</sup>
Winfield.....		C.	3.66 <sup>3</sup> <sub>2</sub>	3.43	1.16 <sup>k</sup>	1.36 <sup>n</sup>	1.45 <sup>g</sup>	2.74 <sup>k</sup>	3.75	6.18	6.82	5.53	4.46 <sup>i</sup>	3.44 <sup>j</sup>	2.52 <sup>i</sup>	1.79 <sup>i</sup>
Ann Arbor.....		S. C.	3.43 <sup>2</sup>	3.16	0.98 <sup>a</sup>	1.29	1.47 <sup>z</sup>	2.53 <sup>e</sup>	3.37 <sup>d</sup>	5.51 <sup>g</sup>	6.04	5.08	4.48 <sup>p</sup>	3.03 <sup>f</sup>	2.43 <sup>b</sup>	1.67 <sup>b</sup>
Battle Creek...		S. C.	3.60	3.57	1.03	1.46	1.94	3.04	3.91	5.88	6.61	5.50	4.40	4.04	2.89	2.13 <sup>j</sup>
Hillsdale.....		S. C.	3.25 <sup>7</sup>	3.25	1.03	1.32	1.40	2.62	3.69	5.70	6.25	5.20	4.33	3.33	2.47	1.62
Kalamazoo.....		S. C.	3.35 <sup>2</sup>	3.16	1.07	1.24	1.30	2.68	3.66	5.44	6.13	5.04	4.09	3.26	2.39	1.59
Marshall.....		S. C.	3.63 <sup>7</sup> <sub>6</sub>	3.47	1.16 <sup>c</sup>	1.46 <sup>k</sup>	1.75	2.89	3.84 <sup>b</sup>	6.07	6.45	5.42	4.55 <sup>i</sup>	3.52 <sup>h</sup>	2.72 <sup>h</sup>	1.81 <sup>h</sup>
Mendon.....		S. C.	3.70 <sup>6</sup> <sub>5</sub>	3.42	1.18	1.52	1.65	2.96	3.84 <sup>a</sup>	5.78	6.48	5.38	4.44	3.45	2.57	1.80
Tecumseh.....		S. C.	3.67 <sup>7</sup> <sub>6</sub>	3.50	1.18	1.47	1.67	2.87	3.74	6.02	6.55	5.63	4.69	3.68	2.61	1.83
Detroit.....		S. E.	3.54 <sup>4</sup> <sub>3</sub>	3.44	1.26 <sup>a</sup>	1.52	1.69	2.78	3.79	5.82	6.22	5.32	4.57	3.52	2.83	1.98
Washington.....		S. E.	3.50	3.31	1.32	1.44	1.55	2.52	3.58	5.68	6.03	5.38	4.53	3.42	2.49	1.73

a, b, c. In the columns from January to December, inclusive, the letters, a, b, c, stand directly above the numbers from which they refer to the notes below.

- a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.  
e For 88 observations. f For 87 observations. g For 86 observations. h For 85 observations.  
i For 84 observations. j For 83 observations. k For 82 observations. l For 81 observations.  
m For 80 observations. n For 79 observations. o For 77 observations. p For 76 observations.  
q For 74 observations. r For 63 observations.

\* At the U. S. Signal Service stations for the year 1883, the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The local time corresponding to these hours is as follows: At Port Huron 6:38 A. M., 2:38 P. M., and 10:38 P. M.; at Detroit 6:36 A. M., 2:36 P. M., and 10:36 P. M.; at Alpena 6:34 A. M., 2:34 P. M., and 10:34 P. M.; at Grand Haven 6:23 A. M., 2:23 P. M., and 10:23 P. M.; at Escanaba 6:20 A. M., 2:20 P. M., and 10:20 P. M.; at Marquette 6:19 A. M., 2:19 P. M., and 10:19 P. M.  
† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 8, page 130.

‡ The full names of the divisions and the counties in each division are stated in Exhibit 1, page 59.

§ This line is an average for all stations for which statements nearly complete are given for every month of the year, Battle Creek and Mendon excepted.

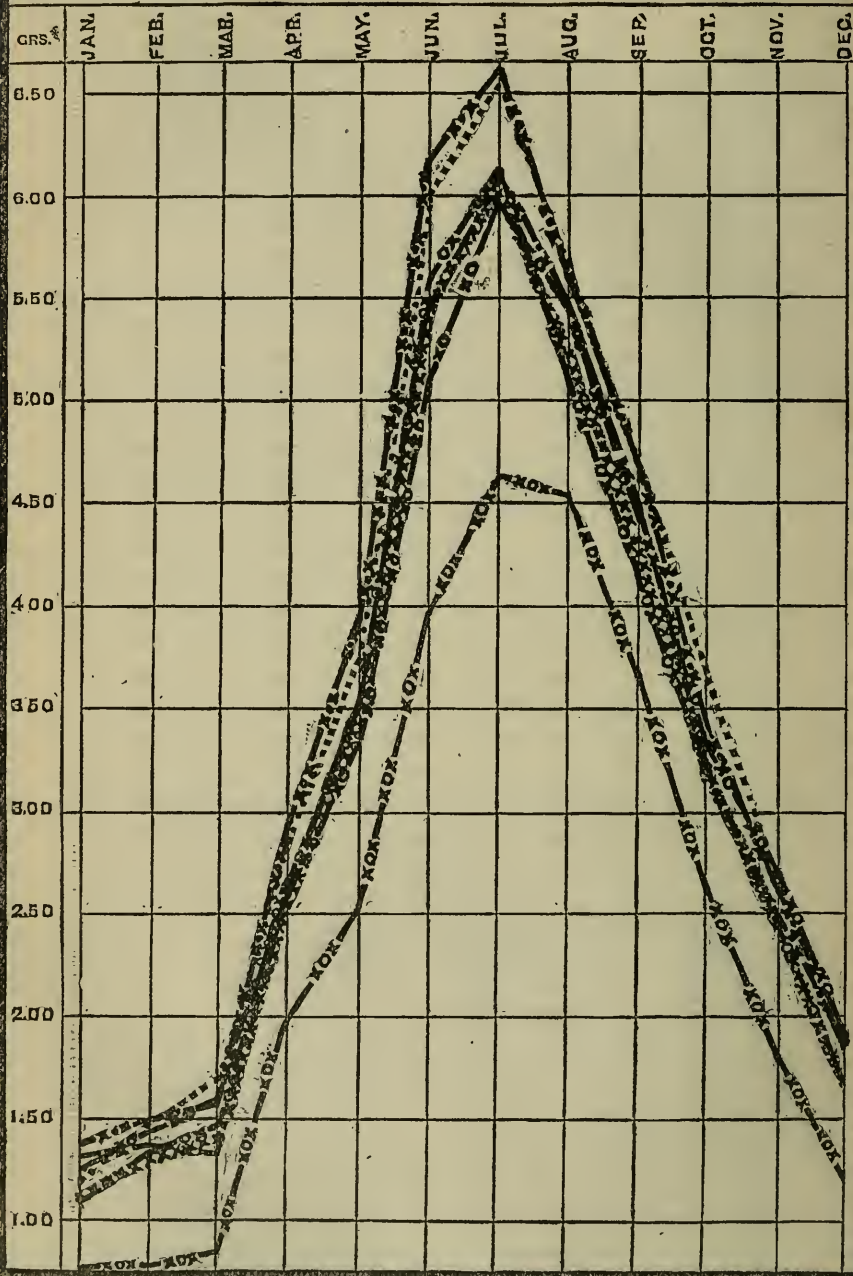
|| Numbers in this column state the average annual Absolute Humidity for periods of years ending in each case with Dec. 31, 1883. The small figures above and at the right of numbers which state the Absolute Humidity, denote the number of years included in the average.

¶ The computations for months in this line were made at Ann Arbor, from Gayot's tables and formula as given in the volume of Smithsonian Misc. Collections. The number of grains of vapor in a cubic foot of air at each observation, Ann Arbor excepted, was determined from readings of the psychrometer by means of Glaisher's table, Table XII. of the Smithsonian Meteorological and Physical Tables (1859).

The lines for 6 stations in Table IV. are graphically represented in Diagram III., page 152.

DIAGRAM III.—ABSOLUTE HUMIDITY, BY MOS., IN 1883.

GRS. OF VAPOR IN CU. FT. OF AIR, AT STATIONS IN MICH., GRAND  
 HAVEN. —X— LANSING. —OX— MARQUETTE —XOX— TRAVERSE  
 CITY —X— TECUMSEH —X— THORNVILLE —X—X— AV. FOR 18  
 STATIONS —XXXXXX—



SCALE: ONE GRAIN OF VAPOR (LINEAL CUT ET. OF AIR) TO 1.08 IN. VERTICALLY.  
 H. B. T. DEL. DES. BY H. B. T.

EXHIBIT 20.—*Comparison of the Average Relative Humidity of the Air (Per Cent of Saturation) for the Year and for each Month of the Year 1883, with Averages for the 19 Years 1864-82, and for 1882.—Observations made at 7 A. M., 2 P. M., and 9 P. M. Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

YEARS, ETC.	PER CENT OF SATURATION,—RELATIVE HUMIDITY.												
	Annu- al Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 19 yrs, 1864-82	79	85	85	84	71	69	76	74	77	80	80	82	86
1882.....	79	89	75	77	67	66	72	72	83	83	81	85	92
1883.....	81	95	94	85	69	72	81	80	74	78	78	80	86
In 1883 <b>Greater</b> than Av. 19 yrs. 1864-82.....	2	10	9	1	-----	3	5	6	-----	-----	-----	-----	0
In 1883 <b>Less</b> than Av. 19 yrs. 1864-82.....	-----	-----	-----	-----	2	-----	-----	-----	3	2	2	2	-----
In 1883 <b>Greater</b> than in 1882.....	2	6	19	8	2	6	9	8	-----	-----	-----	-----	-----
In 1883 <b>Less</b> than in 1882.....	-----	-----	-----	-----	-----	-----	-----	-----	9	5	3	5	6

EXHIBIT 21.—*Average Relative Humidity, by Year and Months, in 1883, compared with Annual and Monthly Averages for 1882, and for the 6 Years, 1878-1883.*

YEARS, ETC.	PER CENT OF SATURATION,—RELATIVE HUMIDITY.												
	Annua- l Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 6 yrs, 1878-83*	75	81	79	76	68	67	72	73	73	75	76	78	82
1882 (22 stat'ns*)	76	81	77	77	68	67	71	70	81	77	76	79	82
1883 (18 stat'ns*)	75	82	81	75	67	70	77	76	71	75	76	76	80
In 1883 <b>Greater</b> than Av. for 6 yrs, 1878-83.....	0	1	2	-----	-----	3	5	3	-----	0	0	-----	-----
In 1883 <b>Less</b> than Av. for 6 yrs, 1878-83.....	-----	-----	-----	1	1	-----	-----	-----	2	0	-----	2	2
In 1883 <b>Greater</b> than in 1882.....	-----	1	4	-----	-----	3	6	6	-----	-----	-----	-----	-----
In 1883 <b>Less</b> than in 1882.....	1	-----	-----	2	1	-----	-----	-----	10	2	-----	3	2

\* 18\* Thornville, Kalamazoo, Tecumseh, and Detroit for the 6 years 1878-83; Mendon for the 5 years 1878-82; Otisville for the 3 years 1878-80 and for 1882; Nirvana for 1878 and 1879; Nirvana and Reed City for 1880; Ann Arbor for the 3 years 1881-83; Niles for 1878, 1879, and 1881; Marquette, Alpena, Grand Haven, Port Huron, and Lansing for the 5 years 1879-83; Woodmere Cemetery for 1878 and 1879; Agricultural College for 1878, and for the 3 years 1881-83; Escanaba and Washington for the 4 years 1880-83; Coldwater for 1878; Petoskey for 1879; Hudson and Malloy Lake for 1881; Marshall, Hillsdale, and Traverse City for 1882 and 1883; Hastings and Harrisville for 1882; Winfield for 1883; Reed City for the 3 years 1881-83; and Battle Creek for 1878, 1879, and 1882.



TABLE V.—RELATIVE HUMIDITY.—Average Per Cent of Saturation of the Atmosphere with Vapor of Water during the Year, and during each Month of the Year 1883, at 20 Stations in Michigan.—Average of Observations made Daily at 7 A. M., 2 P. M. and 9 P. M.,\* by Observers† for the State Board of Health, and for the U. S. Signal Service.

STATIONS IN MICHIGAN.†	Divisions of the State.†	PER CENT OF SATURATION--RELATIVE HUMIDITY.													
		YEAR.		MONTHS, 1883.											
		Normal§	1883.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 18 Stations ‡----	-----	-----	75	82	81	75	67	70	77	76	71	75	76	76	80
Marquette-----	U. P.	5 69	67	68 f	62 i	61	65	61	69	69	67	69	70	68	70
Escanaba-----	U. P.	4 74	74	77	73	69	67	67	75	77	75	78	74	75	77
Traverse City-----	N. W.	2 84	85	93	93	86	79	81	84	83	76	81 d	83	88	93 a
Alpena-----	N. E.	5 75	75	76	75	71	71	71	78	76	71	78	76	81	77
Grand Haven-----	W.	5 75	77	82	81	77	64	69	78	78	78	77	77	78	80
Reed City-----	W.	6 69	68	65	66	61	57	64	72	74	67	73	74	74	68
Port Huron-----	B. & E.	5 76	79	84	86	81	75	75	78	80	74	77	77	80	80
Thorntown-----	B. & E.	6 79	79	93	89 k	81	71	73	78	77	71	75	77	76	86 b
Agricultural College...	C.	20 79	81	95	94	85	69	72	81	80	74	78	78	80	86
Lansing-----	C.	5 70	71	82 a	78	71	61	64	74	72	64	68	73	70	76 a
Winfield-----	C.	3 79	79	85 j	84 m	73	68	72	83 e	82	76	77 f	81 c	78 i	86 k
Ann Arbor-----	S. C.	7 77	76	76 a	81 j	77	70 g	72 d	78 g	75	72	78 f	77 o	75 f	79 b
Battle Creek-----	S. C.	2 72	74	71	75	82	69	70	72	72	64	67	89	76	82 l
Hillsdale-----	S. C.	2 73	72	75	78	69	62	68	76	73	69	71	73	71	76
Kalamazoo-----	S. C.	6 72	70	81	77	62	57	67	75	72	66	64	73	69	73
Marshall-----	S. C.	2 82	75	80 c	83 j	79	66	69 b	78 u	73	68 q	71 n	76 m	79 p	81 h
Mendon-----	S. C.	6 77	74	81	85	72	65	68 a	78 l	74	71 b	71 a	75 a	74	79
Tecumseh-----	S. C.	6 78	80	88	86	83	73	73	80	79	75	79 d	82	78	85
Detroit-----	S. E.	4 71	73	77 a	79	74	65	72	74	72	66	72	73	72	76
Washington-----	S. E.	79	79	93	89	82	66	74	78	75	73	77	81	79	85

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.

e For 88 observations. f For 87 observations. g For 86 observations. h For 85 observations.

i For 83 observations. j For 82 observations. k For 81 observations. l For 80 observations.

m For 79 observations. n For 78 observations. o For 76 observations. p For 74 observations.

q For 68 observations.

\* At the stations of the U. S. Signal Service for the year 1883 the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of these stations is stated in the star (\*) foot-note to Table IV, page 151.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 8, page 130. The full names of the divisions and the counties in each division are stated in Exhibit 1, page 53.

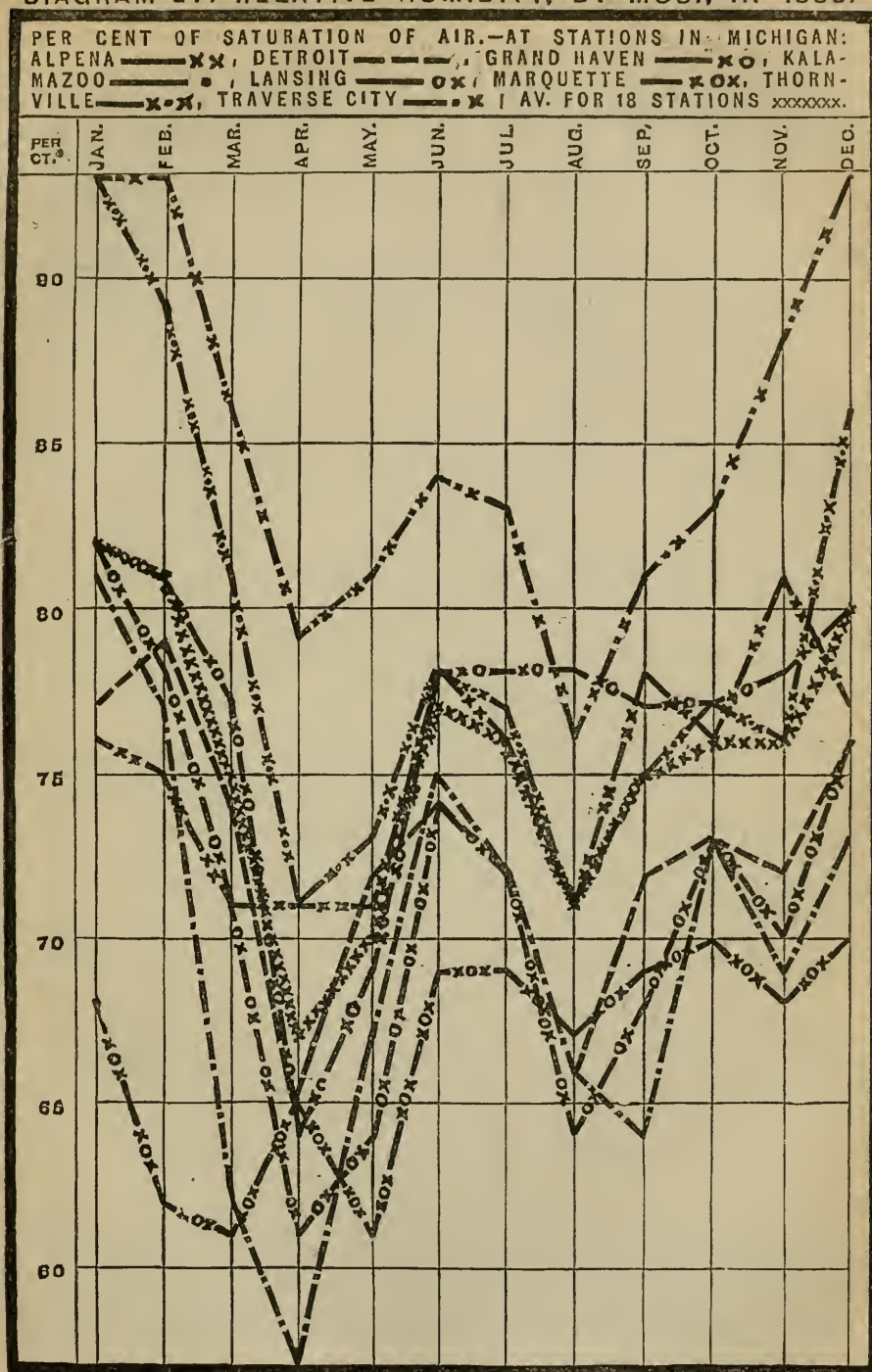
‡ This line is an average for only the stations for which statements nearly complete are given for every month of the year. It does not include Battle Creek or Mendon.

§ Numbers in this column state the average annual Relative Humidity for periods of years ending in each case with Dec. 31, 1883. The small figures above and at the right of the numbers which state the Relative Humidity, denote the number of years included in the average.

NOTE.—The tri-daily observations with the psychrometer at Marquette, Escanaba, Grand Haven, Port Huron, and Detroit for 1883, were reduced (by tables in "Signal Service Order No. 41, 1881, and in Instructions to Voluntary Observers," 1882), and the monthly means for those months were computed, by the observers at those stations. In all other cases the observations were reduced by Guyot's table, in Smithsonian Meteorological Tables, or by a table substantially the same as that. Computations for Ann Arbor were made by the observer there.

Graphic representations of 8 representative lines in table V. are given in Diagram IV., page 155.

DIAGRAM IV. RELATIVE HUMIDITY, BY MOS., IN 1883.



SCALE, TEN PER CENT OF SATURATION TO 1.77 IN. VERTICALLY.

H. B. T., DEL.

DES. BY H. B. B.

## FOGS.

For the year 1883 fog was reported at 155 morning observations, at 22 afternoon observations (at about 2 P. M.), at 39 evening observations (at about

EXHIBIT 24.—*Number of Different Days on which Fog was recorded in 1883, at 28 Stations*

STATIONS IN MICHIGAN.*	No. of Days in 1883.	JANUARY.			FEBRUARY.			Line Number.
		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		
			A. M.	P. M.		A. M.	P. M.	
Marquette.....	6	0			0			2
Escanaba.....	25	28		10:30	28		10:20	3
Manistique.....	1	0			0			4
Traverse City.....	1	0			0			5
Mackinaw City.....	5	0			0			6
Alpena.....	28	0			13	6:34		7
East Tawas.....	1	0			16		2:34	8
Grand Haven.....	15	0			19		10:34	9
Grand Rapids.....	5	0			0	6:23		10
Reed City.....	3	0			13, 16		10:23	11
Port Austin.....	8	0			15			12
Port Huron.....	6	0			0	7		13
Thornville.....	6	28, 29	A. M.		16	6:38		14
Hastings.....	7	13	7		10	A. M.	P. M.	15
Ionia.....	12	0			7		9	16
Lansing.....	17	18	till 10:20		12			17
Swartz Creek.....	6	28	7		13	7		18
Winfield.....	7	15	Evening.		14	A. M.	P. M.	19
Ann Arbor.....	6	18	till 10:30		0			20
Battle Creek.....	5	0	till 10		16	7	P. M.	21
Hillsdale.....	18	9	till 11		15	9:30 to	8	22
Hudson.....	3	0	till 10		0			23
Marshall.....	3	0	till 10		16	7		24
Mendon.....	2	18	till 9		13	7		25
Kalamazoo.....	2	0	till 11		0		9	26
Tecumseh.....	6	0	till 10		14			27
Detroit.....	7	29	till 10		15		{ Evening & }	28
Washington.....	22	29	till nearly noon.		16		night. 2	29
		19						30
								31
								32
								33
								34
								35
								36
								37
								38
								39
								40
								41
								42
								43
								44
								45
								46
								47
								48
								49

\* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 8, page 130.

NOTE.—Monthly registers were received from East Tawas for 7 months, January to April and June to August; from Grand Rapids 4, September to December; from Manistique, December; from Mackinaw City the last 6 days in July, and August to December; from Swartz Creek 11, February to December; from Hastings 4, January to April; from Hudson the last 14 days of October and the



9 P. M.), and 3 times during the day, no special time being mentioned, in many cases the same fog, or fog at the same time, being reported by different observers. Fog was reported, at one or more stations at sometime during the day, on 92 days.

*and in each Month the Dates and Hours of Observation when Fogs were Recorded, in Michigan.*

Line Number.	MARCH.			APRIL.			MAY.			JUNE.		
	Day of Mo.	Hour of Observation.		Day of Mo.	Hour of Observation.		Day of Mo.	Hour of Observation.		Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0			0			7	6:19		3, 11	6:19	
2										9		10:19
3	1	6:20		0			19	6:20		3, 17	6:20	
4										5		10:20
5	0			0			0			0		
6	0			0			0			0		
7	0			0			0			0		
8	1	5 to 9:30		0			0			27	6:34	
9										24		10:34
10												
11	0			0						17	A. M.	
12	0			5	6:23		30	10:23		4, 9, 28	6:23	
13										5, 12		2:23
14	0			0			0			0		
15	0			0			0			0		
16	0			5	7		0			11, 18, 26	7	
17						2				10, 26		2
18										10		9
19	0			0			1	6:38		25	6:38	2:38
20				5	A. M.	P. M.	0			25	7	
21	24	9		5	7							
22												
23												
24												
25	0			5	A. M.		0			14	4 to 6:30	
26										29	4 to 9	
27	0			5	A. M.	P. M.	0					
28												
29												
30	0			5	till noon.		3	8 to	4	0		
31	0			0			0			0		
32												
33	0			0			0			0		
34	0			0			0			0		
35	0			0			0			25, 29	7	
36												
37												
38												
39	0			0			0			0		
40	0			0			0			0		
41	0			0			0			0		
42	0			0			0			10		11 till
43	0			0			0			11	5	
44	0			0			0			0		
45	21	6:36		0			0			0		
46												
47	0			0			0			25	7	
48												
49												

months of November and December. Registers were received, but with no fog recorded thereon, from Harrisville for 9 months, January to April and August to December; from Otisville for 5 months, January to May; from Lexington for October, November, and December; from Agricultural College for full year; from Ypsilanti for 7 months, January to July. A cipher (0) indicates that a monthly register was received from the station with no fog recorded thereon.

EXHIBIT 24.—CONTINUED.—*Dates when*

STATIONS IN MICHIGAN.*	JULY.		AUGUST.		SEPTEMBER.		Line Number.			
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.			Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.			A. M.	P. M.
Marquette.....	0		31	6:19		21	6:19		1	
Escanaba.....	21		10:20	6:20		12,13,18,19,20,24,29	6:20		2	
	22	A. M.	P. M.					10:20	3	
	23	6:20	2:20						4	
Manistique.....									5	
Traverse City.....	23	7	0			0			6	
Mackinaw City.....	c		17	7		0			7	
			19	7	2	22	7		8	
	26	10 till	night	19	6:34	15	5 to 8:50		9	
Alpena.....						18	7:50 till		10	
						19	8:30		11	
						24	6:34		12	
									13	
Grand Haven.....	0		0			0			14	
Grand Rapids.....						0			15	
Reed City.....	0		0			0			16	
Port Haron.....	16	6:38		0		0			17	
Thornville.....	0		27	morn'g		0			18	
Ionia.....	26	4 to 9:30	0			13,14	6 to 8		19	
						22	6 to 12 M.		20	
Lansing.....	0		0			11	7 to 10		21	
						12,13	7		22	
Swartz Creek.....	0		0			14,22	7 to 8:30		23	
						0			24	
Winfield.....	0		0			11,22	A. M.		25	
Ann Arbor.....	0		0			14	till 8:30		26	
Battle Creek.....	0		0			11,14,15,21	7		27	
						22	morning.		28	
Hillsdale.....	24	7	0			22	till 9		29	
Hudson.....									30	
Marshall.....	0		0			22	7		31	
Tecumseh.....	0		0			11,14,15	7		32	
Detroit.....	0		0			14			33	
						15	6:36		34	
Washington.....	0		0			1,14,15,23,24	7		35	
									36	
									37	
									38	
									39	
									40	
									41	
									42	

\* The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 8, page 130.

EXHIBIT 22.—*Number of Different Days on which Fog was Observed at One or more of 21 Stations\* in Michigan in 1883, and in each month of the Year 1883.*

Year, 1883.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
92	8	6	2	1	4	16	6	5	14	11	12	7

NOTE.—Graphic representations of statements in Exhibit 22 are given in Diagram No. V., page 160.

\* This exhibit contains statements only for those localities from which reports were received for every month of the year, as follows: Marquette, Escanaba, Traverse City, Alpena, Grand Haven, Reed City, Port Austin, Port Huron, Thornville, Ionia, Lansing, Winfield, Ann Arbor, Battle Creek, Hillsdale, Kalamazoo, Marshall, Mendon, Tecumseh, Detroit, and Washington. At one of the stations, Agricultural College, no fog was reported.

*Fogs were Recorded in 1883.*

Line Number.	OCTOBER.			NOVEMBER.			DECEMBER.		
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0			0			0		
2							7	A. M.	
3	0			9	6:20				
4				20		2:20			
5							7		1:30 to 3:00
6	0			0			0		
7	0			21,23	7		0		
8									
9	2,5,29	6:34		18	6:34	night till	5	6:34	night till
10	5		night till	19	8:00		6	11	
11	6			20		7 till.			
12	7	5 to 8		21	10				
13	11	5 to 10		23		night till.			
14	12	4:50 to 9:30	24	5					
15	0			10	6:23		5		10:23
16				5,9,22		10:23			
17	28		9	4,7,10	7		12	7	
18	0			10,23			0		
19	0			19	6:38		0		
20	0			0			0		
21	10		9 till	4,10	6 to 10		0		
22	11	11		* 7	6 to 7		0		
23	7,11	7		4,10	7		6	7	
24	10		9						
25									
26	7	morning.		4	5 to 9		0		
27				10	4 to 10		0		
28	0			4	8:30		6	7	
29									
30	0			0			0		
31	12,13			4			0		
32				10	morning.				
33	7,12	7		7	7		6	till 10	
34	28	till 10:30					12	till 8	
35							25	7	
36	0			7	A. M.		6,30	morn'g	
37	0			4,7	7		0		
38	13		9	23			9		
39									
40	0			0			31	6:36	
41	8,12	7		4,10	7		25,31	7	
42	12		9				30	7	2 and 9

EXHIBIT 23.—*Number of Observations at which Fog was Observed in Michigan in 1883, and in each Month of the Year 1883. (Observations taken 3 times Daily at 21 Stations.)\**

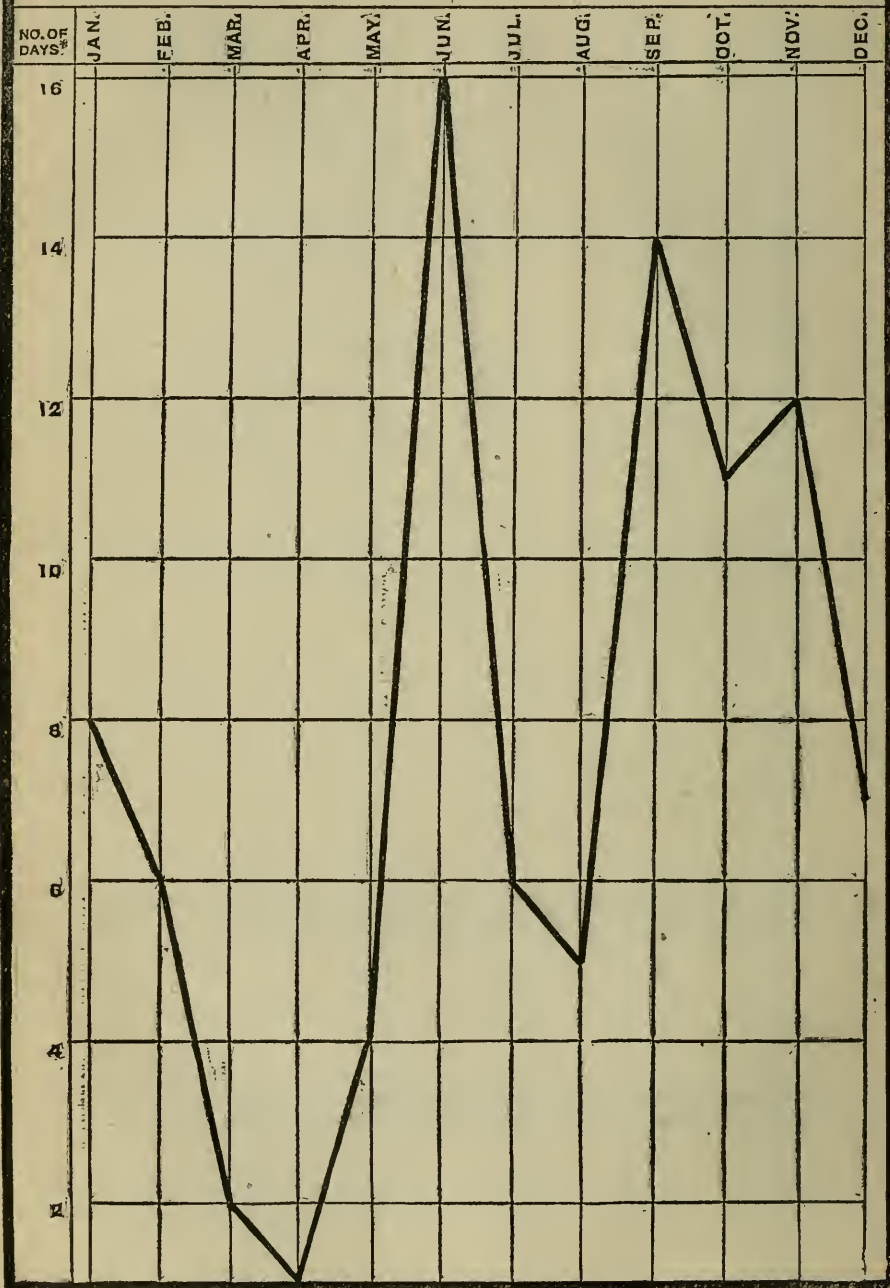
Year, 1883.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
219	19	29	3	9	4	29	12	7	11	22	28	16

\* This exhibit contains statements only for those localities from which registers were received for every month of the year, as stated in a foot-note to Exhibit 22, page 158.



# DIAGRAM V.—CONCERNING FOGS IN MICHIGAN, IN 1883.

NUMBER OF DIFFERENT DAYS ON WHICH FOG WAS OBSERVED AT ONE OR MORE OF TWENTY-ONE STATIONS IN MICHIGAN, BY MONTHS, IN 1883.



SCALE, ONE DAY TO .42 IN. VERTICALLY.

H. B. T. DEL.

DES. BY H. B. B.

EXHIBIT 25.—*Comparison of the Average Per Cent of Cloudiness in the Year and in each Month of the Year 1883, with Averages for the Nineteen Years, 1864-1882, and for the Year 1882. Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

YEARS, ETC.	PER CENT OF CLOUDINESS.												
	Annua- l Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 19 yrs., 1864-82-----	53	72	64	64	56	50	50	46	48	49	58	70	76
1882. ....	59	72	56	68	57	53	53	43	54	43	50	75	86
1883. ....	58	67	61	48	54	66	62	54	34	53	70	58	65
In 1883 <b>Great- er</b> than Av. 19 yrs.—1864-82...	0	-----	-----	-----	-----	16	12	8	-----	4	12	-----	-----
In 1883 <b>Less</b> than Av. 19 yrs.—1864-82...	-----	5	3	16	2	-----	-----	-----	14	-----	-----	12	11
In 1883 <b>Great- er</b> than in 1882 In 1883 <b>Less</b> than in 1882...	-----	-----	5	-----	-----	13	9	11	-----	10	20	-----	-----
	1	5	-----	20	3	-----	-----	-----	20	-----	-----	17	21

EXHIBIT 26.—*Average Per Cent of Cloudiness, by Year and Months, in 1883, compared with Annual and Monthly Average for 1882, and for the seven Years, 1877-1883.\**

YEARS, ETC.	PER CENT OF CLOUDINESS.												
	Annua- l Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 7 years— 1877-83*-----	56	67	60	61	51	47	49	42	42	46	58	68	77
1882 — (23 sta- tions*)-----	61	72	62	71	54	56	53	44	58	44	51	75	85
1883 — (22 sta- tions*)-----	57	69	63	52	53	62	58	51	32	48	68	61	69
In 1883 <b>Great-</b> er than for 7 yrs.—1877-83...	1	2	3	-----	2	15	9	9	-----	2	10	-----	-----
In 1883 <b>Less</b> than for 7 yrs. —1877-83.....	-----	-----	-----	9	-----	-----	-----	-----	10	-----	-----	7	8
In 1883 <b>Great-</b> er than in 1882 In 1883 <b>Less</b> than in 1882...	-----	-----	1	-----	-----	6	5	7	-----	4	17	-----	-----
	4	3	-----	19	1	-----	-----	-----	26	-----	-----	14	16

\* Thornville, Kalamazoo, Mendon, and Tecumseh for the 7 years, 1877-83; Battle Creek for the 4 years, 1877-80, and 1882 and 1883; Nirvana for the 3 years, 1877-79, and for the first 4 months of 1880; Reed City for the last 8 months of 1880, and the 3 years, 1881-83; Detroit for 1877, and for the 5 years, 1879-83; Niles for the 4 years, 1878-81; Benton Harbor for 1877, 1878, and for 1880; Coldwater and Woodmere Cemetery for the 3 years, 1877-79; Otisville for the 3 years, 1878-80, and for 1882; Marquette, Alpena, Grand Haven, Port Huron, Lansing, and Washington for the 5 years, 1879-83; Ypsilanti for 1877 and 1879; Agricultural College for 1877, and for the 3 years, 1881-83; Petoskey for 1878 and 1879; Escanaba and Ann Arbor for the 4 years, 1880-83; Fife Lake for 1877; Ionia for 1880 and 1883; Adrian for 1880; Hillsdale for 1880, 1882, and 1883; Marshall for the 3 years, 1881-83; Parkville for 1881 and 1882; Winfield for 1881 and 1883; Hudson and Mallory Lake for 1881; Harrisville and Hastings for 1882; Traverse City for 1882 and 1883; and Port Austin for 1883.

TABLE VI.—Average Per Cent of Cloudiness for the Year, and for each Month of the Year 1883, at 22 Stations in Michigan,—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,\* by Observers for the State Board of Health,† and for the U. S. Signal Service.

STATIONS IN MICHIGAN.† (Those of the U. S. Signal Service in italics.)	DIVISION OF THE STATE.†	AVERAGE PER CENT OF CLOUDINESS.													
		YEAR.		MONTHS, 1883.											
		Norm. 	1883.	Jan.	Feb.	Mar.	Apr.	May.	J'ne.	J'ly.	Aug.	Sep.	Oct.	Nov.	Dec.
Av. for 22 stat'ns.	-----	-----	57	69	63	52	53	62	58	51	32	48	68	61	69
Marquette.....	U. P.	60 <sup>6</sup> <sub>4</sub>	56	62	50	42	50	54	55	59	34	55	70	71	74
Escanaba.....	U. P.	58 <sup>4</sup>	52	54	57	48	53	57 <sup>c</sup>	48	50 <sup>a</sup>	32 <sup>d</sup>	41 <sup>d</sup>	62	66	60
Traverse City...	N. W.	60 <sup>6</sup> <sub>5</sub>	58	79	65	45	48	62	53	52	27	48	62	74	79
Alpena.....	N. E.	58 <sup>5</sup> <sub>6</sub>	58	63	57	53	56	64	59	54	42	49	60	63	74
Grand Haven...	W.	57 <sup>6</sup>	61	90	71 <sup>j</sup>	54	56 <sup>d</sup>	61	63	53	30	47	67	64 <sup>e</sup>	77
Reed City.....	W.	74 <sup>1</sup>	62	83	62 <sup>q</sup>	57 <sup>i</sup>	61 <sup>r</sup>	68 <sup>o</sup>	65 <sup>l</sup>	57 <sup>k</sup>	26	49 <sup>s</sup>	69 <sup>o</sup>	77 <sup>k</sup>	72 <sup>k</sup>
Port Austin.....	B.&E.	38 <sup>5</sup> <sub>6</sub>	38	46	41	31	35	48	38	25	10	31	52	46	58
Port Huron.....	B.&E.	59 <sup>7</sup>	56	70	59	59	56	65	49	46	29	54	67	55	67
Thornville.....	B.&E.	53 <sup>20</sup>	51	62	58	42	43	59	51	45	25	43	63	52	67
Agr'l College...	C.	58 <sup>1</sup>	58	67	61	48	54	66	62	54	34	53	70	53	65
Ionia.....	C.	62 <sup>5</sup> <sub>5</sub>	62	70	70	55	59	65	66	61	32	52	76	70	73
Lansing.....	C.	55 <sup>3</sup>	57	65	64	54 <sup>c</sup>	45	62 <sup>a</sup>	59	47	34	53 <sup>d</sup>	70	60	69
Winfield.....	C.	61 <sup>4</sup>	61	65	68 <sup>j</sup>	58	55 <sup>e</sup>	64	66	55	37	51 <sup>g</sup>	73	66	69
Ann Arbor.....	S. C.	59 <sup>2</sup>	56	67	63	56 <sup>f</sup>	52	61	56	50	29	50 <sup>a</sup>	70	56	66
Battle Creek...	S. C.	58 <sup>2</sup>	57	73	69	60	55	60	57	46	24	42	70	56	72 <sup>j</sup>
Hillsdale.....	S. C.	63 <sup>7</sup>	63	70	72	54	56	65	65	57	44	56	78	66	73
Kalamazoo....	S. C.	63 <sup>3</sup>	72	86	77	71	70	72	79	65	49	58 <sup>d</sup>	82	74 <sup>e</sup>	78
Marshall.....	S. C.	57 <sup>7</sup>	57	64 <sup>d</sup>	67	58	52	62	63 <sup>e</sup>	49 <sup>f</sup>	32	44 <sup>p</sup>	70 <sup>o</sup>	52 <sup>l</sup>	71 <sup>h</sup>
Mendon.....	S. C.	53 <sup>7</sup>	56	70	68	58	50	61	59	47 <sup>m</sup>	33	41 <sup>g</sup>	71 <sup>d</sup>	52	65
Tecumseh.....	S. C.	48 <sup>6</sup>	53	63	61	40	51	60	54	44	26	43	68	56	66
Detroit.....	S. E.	58 <sup>5</sup> <sub>d</sub>	55	65	64 <sup>j</sup>	53 <sup>b</sup>	56	58 <sup>a</sup>	55 <sup>f</sup>	45 <sup>e</sup>	31	48 <sup>n</sup>	69 <sup>b</sup>	54 <sup>f</sup>	61
Washington.....	S. E.	55	58	73	65	51	59	61	58	51	33	53	67	55	65

a, b, c In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.

e For 88 observations. f For 87 observations. g For 86 observations. h For 85 observations.

i For 84 observations. j For 83 observations. k For 82 observations. l For 80 observations.

m For 79 observations. n For 78 observations. o For 77 observations. p For 76 observations.

q For 75 observations. r For 73 observations. s For 72 observations. t For 65 observations.

\* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of these stations is stated in the star (\*) footnote to Table IV., page 151.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit S, page 130.

‡ The full names of divisions and the counties in each division are stated in Exhibit I, page 59.

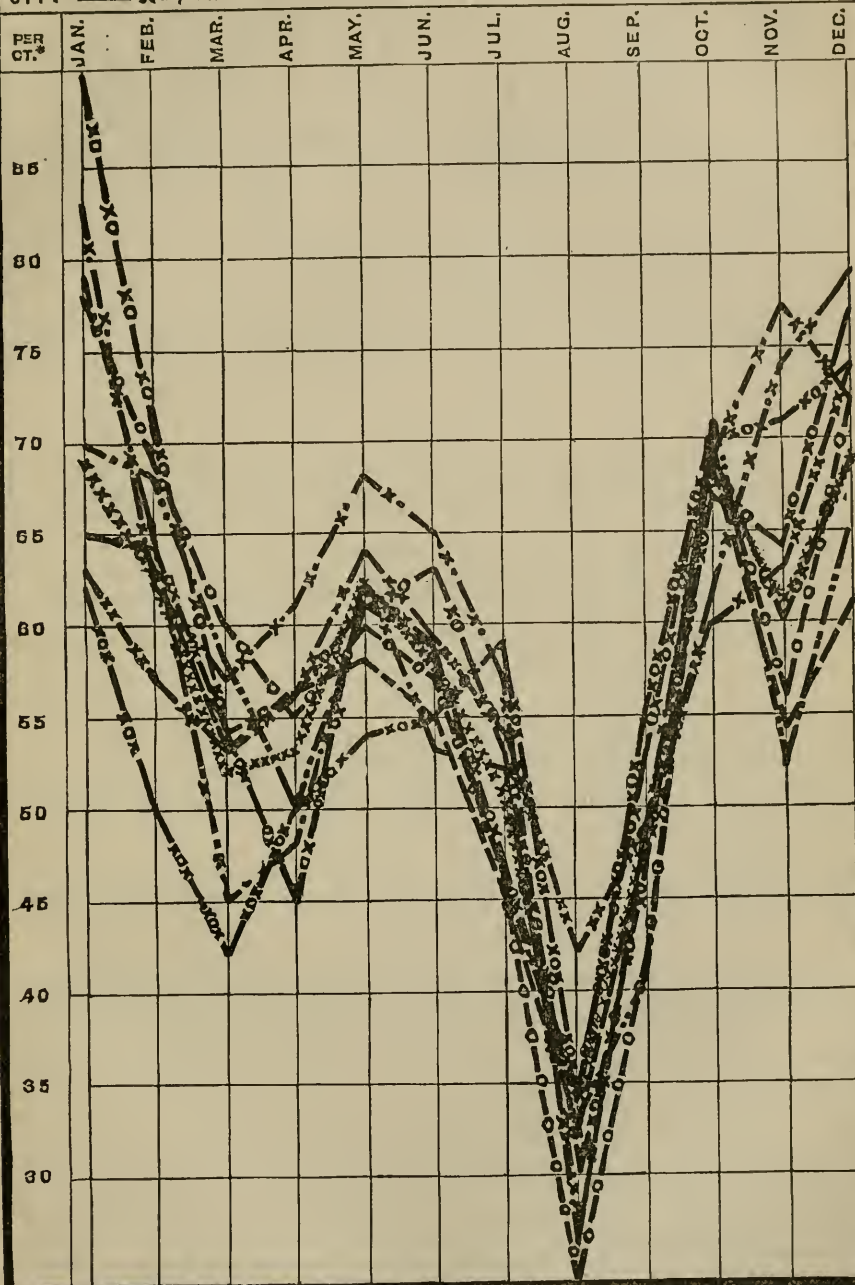
§ Numbers in this column state the average per cent of cloudiness for periods of years ending in each case with Dec. 31, 1833. The small figures above and at the right of numbers which state the per cent of cloudiness, denote the number of years included in the average. Computations of average per cent of cloudiness were made and furnished by the observers at Alpena, Grand Haven, Ionia, and Ann Arbor for each month in 1833. At Marquette for Jan., Mar., and June to Dec., inclusive, and at Port Huron for Apr. to Dec., inclusive.

Graphic representations of 9 representative lines in this table are given in Diagram No. VI., page 163.



DIAGRAM VI.—AV. PER CT. OF CLOUDINESS, MOS., 1883.

PER CENT OF CLOUDINESS.—AT STATIONS IN MICH.: ALPENA ———— xx  
 BATTLE CREEK ———— o , DETROIT ———— , GRAND HAVEN ———— xo  
 LANSING ———— ox , MARQUETTE ———— xox , MENDON ———— , REED  
 CITY ———— x , TRAVERSE CITY ———— x | AV. FOR 22 STATIONS xxxxxxxx.



SCALE, TEN PER CENT TO .95 IN. VERTICALLY.

H. B. T. DEL.

DES. BY H. B. B.

EXHIBIT 27.—*Dates of Auroras Observed and Recorded at Twelve Stations in Michigan during the Year 1883.*

STATIONS.	DATES OF AURORAS RECORDED IN 1883.											
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Escanaba.....	7	1,4,22	1,2,4,6, 12,26,27, 28,29,30	5,7,19,24, 25,27	20,21	-----	9,10,18, 29,30	5,7	2,5,4,16, 18,25,27	16,18	1,2,6	1,27
Alpena.....	-----	-----	1	19,24,25	-----	-----	8,9	-----	4,5,16,25	-----	2	-----
East Tawas.....	-----	-----	-----	19	-----	-----	30	-----	-----	-----	-----	-----
Mackinaw City.....	-----	-----	-----	-----	-----	-----	29	-----	-----	-----	-----	-----
Thornville.....	-----	-----	8,27	-----	-----	-----	2,9,30,31	-----	-----	-----	2,22	-----
Grand Rapids.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	31	1,3	-----
Ionia.....	-----	-----	-----	24,29	-----	-----	-----	5	-----	-----	-----	-----
Lansing.....	-----	27	1,28	24	31	4,7,13	19,28,29, 30,31	2	-----	2	2	-----
Hastings.....	-----	-----	2,3,8,20, 21	19,23,24, 26	-----	-----	-----	-----	-----	-----	-----	-----
Swartz Creek.....	-----	-----	-----	-----	-----	-----	10,29,30	-----	16,26	-----	3	-----
Hillsdale.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	21	-----
Grand Haven.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1

## AURORAS.

(See cirrus.) Feb. 27, 9 P. M., arch and dark segment visible in N. low down, no streamers. Soon after, and while the northern sky was still faintly luminous, there was visible a narrow, interrupted band of clouds (?), *ink-black*, stretching from far east to far west just above the northern horizon.—*Lansing*.

The aurora of April 19 was unusually brilliant.—*Escanaba*.

June 12, 9 P. M. Faint light in N. W., dark, narrow cloud (?) bank extending from N. to W. near horizon; sky clear, except some cirrus; wind W., slight. Diffusive roseate light in N. W. next evening.—*Lansing*.

Sept. 16. Corona almost complete, movement of beams rapid, color bright, yellowish green, with fringe of red; lighted up the whole sky.—*Escanaba*.

## METEORS.

Jan. 3, 7:10 P. M. Brilliant meteor.—*Ionia*.

Jan. 15, in W. at 11 P. M.; path visible for over 20 minutes, bright red, perpendicular, to horizon; passed through an arc of 15° to 20°; seen by many persons.—*Lansing*.

March 15, 7:45 P. M. A meteor of considerable size and brightness shot downward in E. through an arc of about 15°. Appeared like a rocket, and was about 35° to 40° above horizon when first seen.—*Lansing*.

Meteor Jan. 30.—*Swartz Creek*.

April 3. Moderately bright meteor in E. between 9 and 10 P. M.—*Lansing*.

May 23, 9:30 P. M. Small, bright meteor starting in E. near *α Lyrae* and moving N. W. through an arc of about 35°. Sky hazy; moon red.—*Lansing*.

Dec. 1, 11 P. M. Very fine large meteor in N.—*Lansing*.

In the following statement are named for each month in 1883 the days of the month clear ("all or nearly all sunshine"), and the days "all or nearly all cloudy," as observed by Dr. J. S. Caulkins, at Thornville. There is also stated for each month the number of clear and the number of cloudy days as thus determined.

JAN.—Clear, Jan. 3, 9, 11, 14, 15, 17, 18, 21, 22, 23, 25, 28, 29, 30, and 31,—15 days. Cloudy, Jan. 5, 6, 10, 13, 19, 20, 24, and 27,—8 days.

FEB.—Clear, Feb. 5, 7, 8, 9, 12, 13, 18, 21, 22, and 23,—10 days. Cloudy, Feb. 2, 3, 6, 10, 11, 14, 15, 16, 17, 19, 20, 24, 25, 26, and 27,—15 days.

MARCH.—Clear, March 1, 5, 7, 9, 13, 14, 20, 21, 24, 25, 27, 29, and 30,—13 days. Cloudy, March 2, 6, 10, 11, 12, 18, 19, and 26,—8 days.

APRIL.—Clear, April 1, 2, 3, 8, 9, 10, 12, 14, 16, 17, 18, 20, 21, 23, 25, 28, and 29,—17 days. Cloudy, April 4, 5, 6, 22, 24, and 26,—6 days.

MAY.—Clear, May 1, 6, 11, 12, 13, 15, 16, 17, 23, 24, 25, 27, and 29,—13 days. Cloudy, May 2, 3, 4, 8, 9, 10, 14, 18, 19, 20, 21, 22, 26, 30, and 31,—15 days.

JUNE.—Clear, June 1, 2, 7, 8, 13, 14, 15, 21, 22, and 30,—10 days. Cloudy, June 9, 10, 11, 12, 18, 24, 25, 26, 27, and 28,—10 days.

JULY.—Clear, July 1, 5, 6, 8, 9, 10, 11, 15, 17, 19, 25, 26, 28, 29, 30, and 31,—16 days. Cloudy, July 7, 13, 21, and 23,—4 days.

AUG.—Clear, Aug. 1, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, and 30,—24 days. Cloudy, Aug. 13,—1 day.

SEPT.—Clear, Sept. 1, 3, 4, 5, 6, 9, 10, 11, 12, 15, 17, 18, 26, and 27,—14 days. Cloudy, Sept. 2, 7, 13, 16, 19, 20, 21, 23, 24, 28, and 29,—11 days.

OCT.—Clear, Oct. 1, 2, 3, 4, 7, 8, 15, 16, 17, 26, and 30,—11 days. Cloudy, Oct. 6, 12, 13, 14, 18, 20, 21, 22, 23, 24, 25, 27, 28, and 29,—14 days.

NOV.—Clear, Nov. 4, 8, 10, 11, 14, 16, 17, 19, 25, and 27,—10 days. Cloudy, Nov. 1, 5, 6, 9, 13, 15, 18, 20, 21, 22, 23, 29, and 30,—13 days.

DEC.—Clear, Dec. 3, 5, 9, 10, 12, 13, 19, and 24,—8 days. Cloudy, Dec. 2, 7, 8, 14, 15, 16, 17, 18, 21, 23, 25, 26, 30, and 31,—14 days.

In the following statement are named the days of the months clear (80 per cent or more of sunshine), and the days "all or nearly all cloudy" (80 per cent or more), from January to July, 1883, inclusive, as observed by Erwin F. Smith, at Lansing. There is also stated for each month the total clear and the total cloudy days as thus determined.

JAN.—Clear, 3, 9, 11, 16, 18, 21, 23, 25, 28, 29,—10 days. Cloudy, 1, 2, 4, 5, 6, 10, 12, 13, 17, 19, 20, 24, 26, 27, 30, 31,—16 days.

FEB.—Clear, 5, 7, 8, 9, 12, 18, 21, 23,—8 days. Cloudy, 1, 2, 3, 4, 6, 10, 11, 14, 15, 16, 17, 20, 24, 25, 26, 27,—16 days.

MARCH.—Clear, 1, 2, 4, 5, 7, 9, 13, 14, 21, 24, 30,—11 days. Cloudy, 6, 10, 11, 12, 15, 16, 18, 19, 22, 26,—10 days.

APRIL.—Clear, 1, 2, 8, 9, 10, 12, 14, 16, 17, 21, 23, 25, 29,—13 days. Cloudy, 3, 4, 5, 6, 18, 19, 22, 24, 26, 30,—10 days.

MAY.—Clear, 6, 7, 11, 12, 15, 16, 23, 24, 27,—9 days. Cloudy, 2, 3, 4, 5, 8, 9, 10, 14, 20, 21, 22, 26, 28, 30,—14 days.

JUNE.—Clear, 1, 2, 7, 8, 14, 15, 21, 22, 30,—9 days. Cloudy, 3, 5, 6, 9, 10, 11, 12, 13, 16, 18, 24, 25, 26, 27, 28, 29,—16 days.

JULY.—Clear, 1, 3, 4, 5, 8, 9, 10, 11, 15, 18, 19, 23, 29, 30, 31,—15 days. Cloudy, 2, 6, 7, 12, 13, 14, 20, 21, 22, 23, 27,—11 days.

#### HALOS.

Feb. 13, 7 P. M., bright and perfect lunar halo; sky hazy. Followed in night and next day by rain.—*Lansing*.

Mar. 2, 4 P. M. Halo with two bright parhelia, one above and one S. of sun; arc of another halo visible on left of sun. Outer halo faint, prismatic colors visible in both, and both halos remaining for some time. Clouds bluish-gray cirro-stratus and cirro-cumulus. Followed on Mar. 4 by snow. Mar. 11, 7 A. M. Faint solar halo; clouds cirrus. Slight flurry of snow on morning of Mar. 12. Mar. 13, 2 P. M. Partial halo. Sky overspread with thin cirrus and cirro-stratus; wind W., 25 miles per hour; barometer 29.10; temp. 45°; weather sunny and delightful; fine also throughout next day. Mar. 17, 7:30 P. M. Lunar halo and corona; sky hazy with cirro-stratus; barometer low; wind blowing strong from S. W.; followed by slight rain in night.—*Lansing*.

Lunar halos (April 12, 9 P. M.); followed by rain next morning (.11 inch.) April 14, 9 P. M., indistinct with corona; clouds cirrus and cirro-stratus; followed early next morning by rain (.23 inch.) April 17, 11 P. M., indistinct with corona; clouds cirrus; followed by rain afternoon of Apr. 18 and morning of Apr. 19 (.25 inch.)—*Lansing*.

May 13, 10 P. M. Lunar halo and small bright corona on dense cirrus haze; followed by heavy storm of wind and rain on May 19 from S. W. and W. May 24, 11:30 A. M. Solar halo on cirro-cumulus clouds. Earlier in the day the sky was covered with patches of cirro-cumulus (mackerel sky); followed by rain (.59 inch.) in the night of May 25 and next morning.—*Lansing*.

June 8, 5 P. M. Solar halo, well defined on cirro-stratus haze; followed by rain from the S. E. at 1:30 A. M., lasting till 7:20 A. M. (.69 inch.), and by lowering weather until the morning of June 11, including another rain (1.50 inches) during the night of June 10. June 14. Solar halo, from 10 A. M. to 1 P. M., sky somewhat hazy, and noticeably darker inside of the halo, which was brilliant with prismatic colors. Lunar halo and small corona on cirro-stratus clouds at 9 P. M.; followed by rain forenoon of June 16 (.12 inch.), and again on June 17 (1.61 inches), and by a wind storm with rain on P. M. of June 18; wind from W., 192 miles in 6 hours. Appearance of a very heavy storm at 10:55 A. M. of 18th in N. and N. W.—*Lansing*.



EXHIBIT 28.—*Dates of Solar and Lunar Halos,*

Line Number.	STATIONS.	DATES OF HALOS RECORDED,									
		JANUARY.		FEBRUARY.		MARCH.		APRIL.		MAY.	
		Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.
1	Thornville .....	4	-----	-----	-----	-----	29	-----	-----	-----	-----
2	Escanaba .....	-----	18	10	12,13,15	31	23	12,20	18,20,23	-----	13
3	Kalamazoo .....	-----	-----	26	-----	-----	-----	-----	-----	-----	-----
4	Hastings .....	-----	24	-----	-----	-----	21,24	-----	10,12,14,19	-----	-----
5	Lansing .....	1,4,10,22	1,15,18,21	7,27	13,21	{ 2,5,11,13 } 25,26	17,23,24	-----	-----	24	18
6	Alpena .....	-----	-----	-----	-----	12	-----	-----	-----	-----	13,17
7	Swartz Creek ..	-----	-----	-----	-----	16,28,30	29	18,25	11,12	9,17	-----
8	Port Austin .....	-----	-----	-----	-----	13	-----	13,20	20	-----	15
9	Traverse City ..	-----	-----	-----	-----	-----	-----	13,19	19	-----	-----
10	East Tawas .....	-----	-----	-----	-----	-----	-----	-----	20	-----	-----
11	Grand Haven .....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
12	Grand Rapids ..	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
13	Hudson .....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

NOTE.—An unusual redness of sky was reported from the following stations in November and December: Thornville, Hillsdale, Port Austin, Escanaba, Hudson, Lansing, and Manistique.

July 2. Solar halo; followed by slight rains on 3d and 4th. July 20, 2:15 A. M. Lunar halo, indistinct; 7 A. M., solar halo, well defined; followed by heavy rains on July 20, 21, 22, and 23; total precipitation of 4 days, 7.47 inches. July 23, 2:10 P. M., well defined solar halo; 6 P. M., solar halo and bright parhelia on right and left of sun. No rain followed.—*Lansing*.

## CORONÆ.

Jan. 22. Lunar corona of three rings; inner, orange-yellow; middle, dark violet; outer, pale greenish; radius of outer ring about 4°. Jan. 23. Sky overcast with parallel bands of thin, hazy cirro-stratus; direction N. E. to S. W. Small, bright lunar corona; followed in night and next day by snow. Jan. 24. Lunar corona. Jan. 25. Bright lunar corona in form of Greek cross; moon 22° above horizon. Followed by snow and sleet on night of 26th.—*Lansing*.

Lunar corona, Feb. 17, 18, 19, 20, 21, 22, 23. That of Feb. 19 was followed by snow next morning; that of Feb. 23 by rain in morning.—*Lansing*.

April 10, 9 P. M. Lunar corona; nimbus clouds and diffuse lightning in W. and N. W.; followed by wind storm on April 11, with an average velocity of 40 miles per hour from 3 A. M. till 12 M. Lunar corona, July 12. July 13, 7 P. M., solar corona, red; 9 P. M., small, bright lunar corona and faint halo; followed by slight rain in early morning.—*Lansing*.

## PARHELIA (SEE HALOS).

Jan. 22, bright parhelia at 7:30 A. M. On each side of sun; halo partial at 9:30 A. M., complete at 11:30 A. M. Followed by snow on 23d and 24th. Jan. 25, bright parhelia in sky above sun at sunrise, followed by snow and sleet on night of 26th.—*Lansing*.

Feb. 7, 7:20 A. M. Bright shaft extending upward from sun 20° or more, visible for one-half hour or more; seen again at sunset. Feb. 24. Parhelia at sunrise 22° above the sun; partial halo visible half hour later. Wind S. E., sky curdly, barometer falling. Rain set in at 11:30 A. M. and continued until midnight.—*Lansing*.

March 9, 7:15 A. M. Bright parhelia N. of sun. Sky overcast most of day with thin cirrus. Falling barometer, rising temperature, melting snow. Parhelia again at sunset S. of sun; cirrus clouds; followed by rain and snow from night of Feb. 9 to night of Feb. 10.—*Lansing*.

Recorded on the Monthly Registers in 1883.

—MONTHS IN 1883.

JUNE.		JULY.		AUGUST.		SEPTEMBER.		OCTOBER.		NOVEMBER.	DECEMBER.		Line Number.
Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Lunar.	Solar.	Lunar.	
					14		12					6,10	1
2,14											17,20	10	2
													3
													4
8,14	14,16	2,13,20,29	20	14	11					8,9,13	13,15,16	10,14,19	5
15			22		11,19	9	12,15		11	8,14			6
5,21	14	9,20	13	14	11,13,14		12,16	4	17	8,9,13	13,19	6,10,19,20	7
							12						8
													9
													10
	14,20									3,8,9	16,26	4,9,10,11,12	11
								6,7					12
										8,9			13

## CIRRUS, POLAR BANDS, ETC.

See coronæ and halos. Jan. 8, 5:30 P. M. Polar bands, direction S. W. to N. E. Jan. 14, 1 P. M. sky overcast with very beautiful ash-gray cirrus and cirro-stratus, a few cumulus clouds in lower currents; 10:30 P. M. sky covered with hazy streamers of cirrus, very faint and much resembling aurora, radiating fan-shaped from N. E., stars visible through streamers. Jan. 15, 9 P. M. Hazy bands of cirrus, and cirro-cumulus, similar to last night and very striking in appearance. Snow fall of 3 inches on night of Jan. 16. Jan. 24, 11:00 P. M. Sky overcast with shifting, hazy bands of cirro-stratus, resembling aurora, direction E. and W.—*Lansing*.

Feb. 6, 7:30 A. M. Polar bands, general direction E. and W., followed by snow (4 P. M. until 3 A. M.) of 4.50 inches. Feb. 9. Eastern sky red and lowering at sunrise. Sky covered with narrow, horizontal bands of bluish-gray cirro-stratus and stratus; atmosphere smoky, followed in night by snow of one inch. Feb. 21, 9 P. M. Bands of hazy, bluish-gray cirro-stratus; direction S. W., N. E., and afterwards E. and W., followed in morning by snow.—*Lansing*.

Mar. 3, 2 P. M. Bands of bluish-gray cirro-stratus, direction S. E. to N. W.; also innumerable small patches of cirro-cumulus. Followed at midnight by snow, which continued until 9:30 A. M. (2 inches).—*Lansing*.

June 23, 7 P. M. Upper current full of fine cirrus (wool filaments) which moved rapidly due east until the sky was filled. Lower current, with cumulus moving due north. Some cirro-cumulus clouds, and later nearly all the ordinary cloud forms visible. 9 P. M. Lightning and appearance of a distant storm in S. W. Sky mostly clear. Followed by rain, with some thunder and lightning from 1 A. M. to 3 A. M. (.16 inch), and again by rain of .40 inch later in the day.—*Lansing*.

July 5, 9 P. M. Cirrus cloud bands S. of zenith, direction E. and W. Followed by sprinkle on evening of 6th and by rain (.22 inch) on forenoon of 7th. July 23, 10:50 A. M. Nimbus clouds moving from S. E. to N. W., surface wind blowing from N. W. Appearance of heavy storm on southwestern horizon. At this hour a tornado passed south of this station through south part of Eaton and Ingham counties. The next morning at 10 A. M. the lower clouds of torn and ragged cumulus were moving west, while the upper air current was moving in a nearly contrary direction.—*Lansing*.

EXHIBIT 29.—*Comparison of the Rainfall during the Year and during each Month of the Year 1883, with that for the Year 1882; and with the Average for the 19 Years, 1864-82. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

YEARS, ETC.	INCHES OF RAIN AND MELTED SNOW.												
	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 19 yrs. 1864-82-----	31.29	1.73	1.82	2.74	2.56	2.99	4.00	3.29	2.87	2.88	2.46	2.16	1.82
1882-----	32.58	1.17	2.28	3.58	1.88	4.04	5.57	2.32	5.72	.67	2.64	1.83	.88
1883-----	48.44	1.53	4.50	.71	1.90	5.66	11.35	11.27	.18	2.34	3.66	3.98	1.36
In 1883 <b>Great- er</b> than Av. for 1864-82 ...	17.15	-----	2.68	-----	-----	2.67	7.35	7.98	-----	-----	1.20	1.82	-----
In 1883 <b>Less</b> than Av. for 1864-82-----	-----	.20	-----	2.03	.66	-----	-----	-----	2.69	.54	-----	-----	.46
In 1883 <b>Great- er</b> than in 1882	15.86	.36	2.22	-----	.02	1.62	5.78	8.95	-----	1.67	1.02	2.15	.48
In 1883 <b>Less</b> than in 1882-----	-----	-----	-----	2.87	-----	-----	-----	-----	5.54	-----	-----	-----	-----

EXHIBIT 30.—*Inches of Rain and Melted Snow by Years and Months, in 1883, compared with Annual and Monthly Average for 1882, and for the 7 Years, 1877-1883.*

YEARS, ETC.	INCHES OF RAIN AND MELTED SNOW.												
	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 7 yrs, 1877-83*	38.99	1.89	2.62	2.69	2.76	3.65	4.73	4.08	3.40	3.42	3.75	3.55	2.51
1882 (23 stat'ns*)	37.25	1.97	2.72	3.66	2.17	4.45	5.40	2.47	5.61	1.63	2.92	2.24	2.01
1883 (19 stat'ns*)	40.91	1.91	4.14	1.02	1.81	6.02	7.41	6.27	1.06	2.37	3.34	3.89	1.67
In 1883 <b>Greater</b> than for 7 yrs, 1877-83 .....	1.92	.02	1.52	-----	-----	2.37	2.68	2.19	-----	-----	.34	-----	-----
In 1883 <b>Less</b> than for 7 yrs, 1877-83 .....	-----	-----	-----	1.67	.95	-----	-----	-----	2.34	1.05	.41	-----	.84
In 1883 <b>Greater</b> than in 1882	3.66	-----	1.42	-----	-----	1.57	2.01	3.80	-----	.74	.42	1.65	-----
In 1883 <b>Less</b> than in 1882 .....	-----	.06	-----	2.64	.36	-----	-----	-----	4.55	-----	-----	-----	.34

\* Thornville, Kalamazoo, and Detroit for the 7 years 1877-83; Mendon for 1877 and 1878, and also for the 3 years, 1880-82; Tecumseh for the years 1877-78 and 1880-83; Niles for the 4 years, 1878-81; Nirvana, Coldwater, and Woodmere Cemetery for the 3 years, 1877-79; Agricultural College for 1877 and 1878, and also for the 3 years 1881-83; Otisville for the 3 years 1878-80, also for 1882; Marquette, Alpena, Grand Haven, and Port Huron for the 5 years, 1879-83; Battle Creek and Benton Harbor for 1877 and 1878; Escanaba, Lansing, and Washington for the 4 years, 1880-83; Fife Lake and Ypsilanti for the year 1877; Harrisville for 1881 and 1882; Reed City and Winfield for the 3 years 1881-83; Ann Arbor for 1881 and 1882; Marshall for the 3 years 1881-83; Hudson and Mallory Lake for 1881; Traverse City, Hillsdale, and Parkville for 1882 and 1883; Hastings for 1882; and Ionia for 1883.



TABLE VII.—*Inches of Rain and Melted Snow, for the Year and for each Month of the Year 1883, at 19 Stations in Michigan,—as compiled from Daily Observations made by Observers\* for the State Board of Health, and for the U. S. Signal Service.*

STATIONS IN MICHIGAN.* (Those of U. S. Signal Service in Italics.)	Divi- sions of the State. †	INCHES OF RAIN AND MELTED SNOW.													
		YEAR.		MONTHS, 1883.											
		Norm. ‡	1883.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 19 sta- tions.		-----	40.91	1.91	4.14	1.02	1.81	6.02	7.41	6.27	1.06	2.37	3.34	3.89	1.67
		12													
Marquette.....	U. P.	32.63 <sub>12</sub>	30.59	2.36	1.43	.62	2.02	2.74	4.56	4.04	2.11	3.24	2.58	2.88	2.01
Escanaba.....	U. P.	35.29	30.02	1.29	1.27	.33	1.69	1.96	5.43	4.74	1.17	2.92	3.93	3.62	1.67
Traverse City..	N. W.	----- <sub>11</sub>	43.17	3.97	2.31	1.40	2.14	6.67	4.90	6.52	1.84	2.76	3.42	4.46	2.78
Alpena.....	N. E.	38.21 <sub>8</sub>	35.32	2.19	2.02	.66	1.72	4.56	5.47	5.85	1.36	2.45	3.38	3.46	2.20
Grand Haven...	W.	40.96 <sub>5</sub>	44.84	2.44	4.30	.57	1.49	6.02	9.24	7.96	.46	2.29	3.67	4.86	1.54
Reed City.....	W.	39.88 <sub>9</sub>	41.42	2.13	3.86	1.39	1.91	5.32	8.66	4.14	1.81	3.11	2.77	4.53	1.79
Port Huron.....	B.&E.	35.20 <sub>7</sub>	36.98	1.65	4.00	2.86	1.26	5.69	5.71	5.63	.59	2.24	3.47	2.58	1.30
Thornville.....	B.&E.	34.68 <sub>20</sub>	40.83	.84	3.94	1.54	1.51	5.64	9.14	6.67	.86	3.12	3.69	1.85	2.03
Agr'l College...	C.	32.15	48.44	1.53	4.50	.71	1.90	5.66	11.35	11.27	.18	2.34	3.66	3.98	1.36
Ionia.....	C.	----- <sub>4</sub>	43.49	2.50	4.78	.77	1.70	6.43	8.49	7.44	.07	3.00	3.28	3.76	1.27
Lansing.....	C.	40.78 <sub>3</sub>	46.27	.98	4.49	.34	1.89	6.31	9.91	10.12	.21	3.37	3.64	4.08	.93
Winfield.....	C.	39.12 <sub>2</sub>	43.05	1.74	6.79	.45	1.86	7.62	8.63	4.60	.68	2.61	2.99	3.97	1.11
Hillsdale.....	S. C.	39.53 <sub>7</sub>	43.40	1.47	5.57	.92	2.26	8.62	5.97	5.25	1.77	1.82	4.22	3.66	1.87
Kalamazoo.....	S. C.	40.35 <sub>3</sub>	36.33	2.23	2.47	.26	1.36	6.37	8.15	4.15	.42	1.14	2.97	4.65	2.16
Marshall.....	S. C.	41.58 <sub>8</sub>	48.47	1.69	8.09	1.60	2.55	8.41	10.41	3.91	.49	1.74	3.14	5.25	1.28
Parkville.....	S. C.	53.73 <sub>4</sub>	55.27	2.39	7.30	.91	2.80	9.26	7.55	9.27	1.60	1.68	3.80	7.92	.79
Tecumseh.....	S. C.	42.48 <sub>12</sub>	41.15	1.59	5.18	1.77	1.68	6.95	5.06	6.49	2.97	1.41	3.31	2.75	1.99
Detroit.....	S. E.	36.12 <sub>4</sub>	32.49	1.69	3.22	1.55	1.45	5.11	4.32	5.29	.90	1.50	2.55	2.24	2.67
Washington....	S. E.	35.86	35.80	1.68	3.09	.72	1.11	5.10	7.92	5.71	.80	2.32	2.94	3.38	1.03

\* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 8, page 130.

† The names of divisions, and the counties in each are stated in Exhibit 1, page 59.

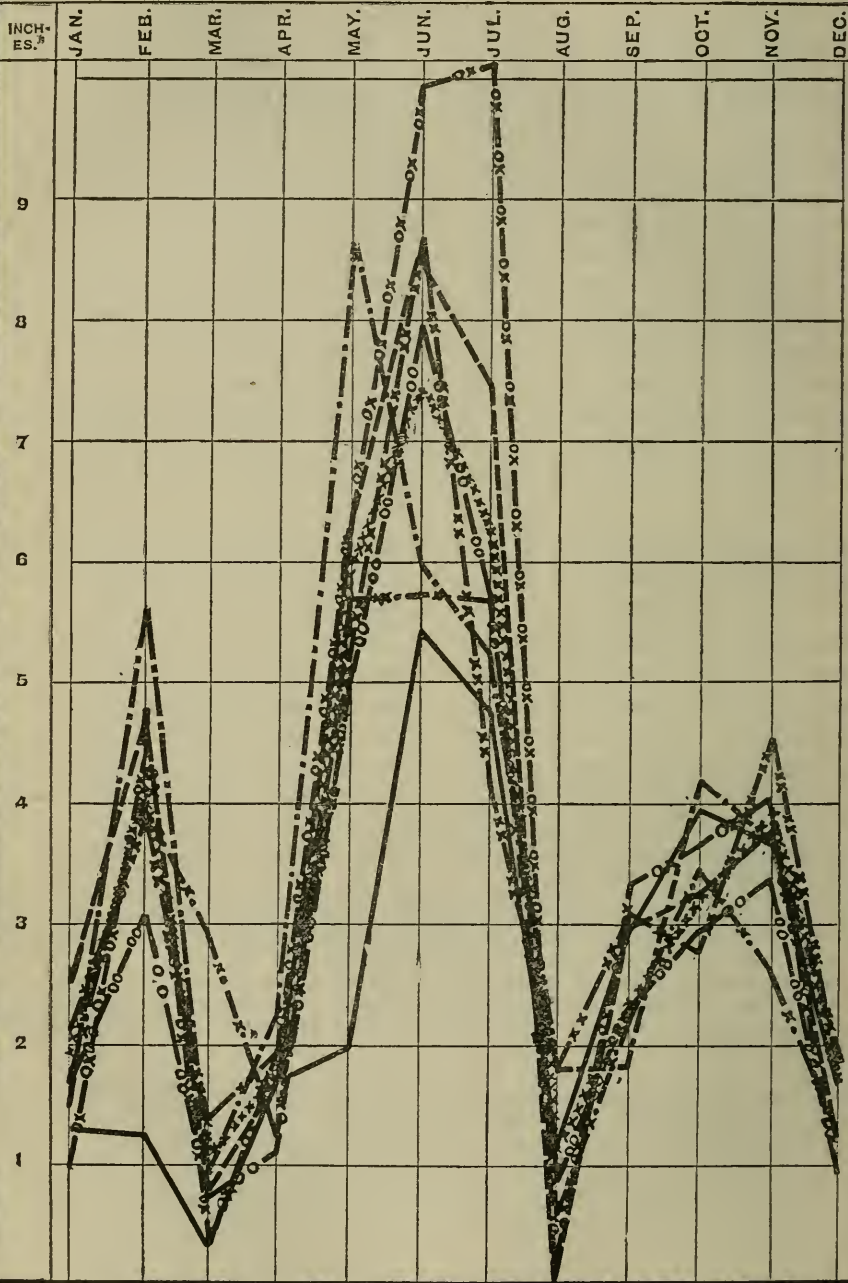
‡ Numbers in this column state the average annual rainfall for periods of years ending in each case with Dec. 31, 1883. The small figures above and at the right of numbers which state the rainfall, denote the number of years included in the average.

NOTE.—Computations of amount of rain fall were furnished by the observers at Alpena, Grand Haven, and Ionia for the year; at Marquette, Jan. to Apr., inclusive, June to Oct., inclusive, and Dec.; Escanaba, Jan. to Oct., inclusive, and Dec.; Port Huron, Mar. to Dec., inclusive; Detroit, Jan. to Mar., inclusive, and May to Dec., inclusive.

The lines for 7 representative stations in Table VII. are graphically represented in Diagram VII., page 170.

DIAGRAM VII.—RAINFALL, BY MONTHS IN 1883.

INCHES OF RAIN AND MELTED SNOW.—AT STATIONS IN MICHIGAN:  
 ESCANABA ———, HILLSDALE ———, IONIA ———,  
 LANSING ———, PORT HURON ———, REED CITY ———,  
 WASHINGTON ———; AVERAGE FOR 19 STATIONS xxxxxxxx.



\*SCALE, 1 IN. RAINFALL TO .63 IN. VERTICALLY.

H. B. T. DEL.

DES. BY H. B. B.

TABLE VIII.—*Relative Amount of Ozone in the Atmosphere, by Day, during Year, and during each Month of the Year 1883, at 20 Stations in Michigan,—as Indicated by Averages of Observations made Daily by Exposing Test-paper prepared according to Schönbein's formula, from 7 A. M. to 2 P. M.—Recorded according to a scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by Ozone equals 10) by Observers for the State Board of Health, and for the U. S. Signal Service.\**

STATIONS IN MICHIGAN.*  (Those of U. S. Signal Service in italics.)	Divi- sions of the State.*	DEGREES OF COLORATION OF TEST-PAPER—DAY OBSERVATIONS.													
		YEAR.		MONTHS, 1883.											
		Norm. †	1883.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 sta- tions.		-----	3.19	3.88	4.01	3.49	3.30	3.31	3.06	2.91	2.63	2.65	2.87	2.97	3.25
		<sup>1</sup> -----													
Marquette.....	U. P.	2.53 <sub>3</sub>	2.53	2.45	2.54	2.91	2.50	3.23	2.43	2.42	2.10	2.20	2.00	2.67	2.87
Escanaba.....	U. P.	3.30 <sub>2</sub>	3.74	3.40	5.10	4.80	5.50	3.90	4.40	3.20	3.60	2.10	2.90	3.00	3.00
Traverse City..	N. W.	2.90 <sub>5</sub>	2.59	4.06	3.82	3.84	3.17	2.58	2.13	2.10	1.29	1.33	1.35	2.33	3.03
Alpena.....	N. E.	3.34 <sub>4</sub>	2.99	4.26	3.93	2.68	2.83	2.87	3.57	3.48	2.29	2.80	2.48	2.43	2.29
Grand Haven..	W.	3.87 <sub>5</sub>	4.03	3.40	3.00	3.60	3.80	4.30	4.20	4.50	4.60	4.70	4.60	4.10	3.50
Reed City.....	W.	3.60 <sub>1</sub>	3.13	3.58	3.39 <sub>d</sub>	3.23 <sub>a</sub>	3.20 <sub>c</sub>	2.65	3.10 <sub>f</sub>	2.65 <sub>g</sub>	2.42 <sub>f</sub>	2.80	3.26	3.50	3.77
Port Austin...	B. & E.	2.91 <sub>3</sub>	2.91	4.06	3.59	2.93	3.25	2.48	2.68	3.00	2.28	2.24	2.26	2.86	3.29
Port Huron.....	B. & E.	2.85 <sub>7</sub>	2.48	2.35	2.64	2.61	2.47	2.26	2.40	2.77	1.81	2.33	2.16	2.87	3.13
Thornville.....	B. & E.	2.74 <sub>1</sub>	3.02	4.65	5.14	3.52	2.67	2.87	2.70	2.29	1.68	2.20	2.48	2.57	3.48
Ionia.....	C.	2.47 <sub>5</sub>	2.47	2.96	2.78	2.38	2.50	3.03	2.63	2.87	2.45	2.66	2.35	1.76	1.32
Lansing.....	C.	3.45 <sub>3</sub>	3.36	4.10	4.04	4.06	3.73	3.13	3.83	3.10	2.81	2.50	2.55	3.00	3.48
Winfield.....	C.	4.97 <sub>4</sub>	5.17	6.26	7.07 <sub>d</sub>	5.92 <sub>c</sub>	4.97 <sub>d</sub>	5.13	4.53 <sub>b</sub>	4.87 <sub>d</sub>	4.40	4.38	4.40	4.72 <sub>a</sub>	5.39 <sub>a</sub>
Ann Arbor†.....	S. C.	2.33 <sub>21</sub>	3.20	3.00	3.70 <sub>d</sub>	3.00 <sub>b</sub>	3.26	3.68	2.90	2.89	3.00	3.17	4.00 <sub>a</sub>	3.07 <sub>b</sub>	2.67
Battle Creek...	S. C.	2.79 <sub>2</sub>	2.68	3.29	3.48	2.86	2.73	2.58	2.43	2.45	2.55	2.27	2.70	2.24	2.61
Hillsdale.....	S. C.	3.01 <sub>7</sub>	2.99	3.26	3.89	3.48	3.00	3.23	2.73	2.48	2.42	2.37	2.87	2.77	3.33
Kalamazoo.....	S. C.	2.76 <sub>3</sub>	3.12	4.00	3.89	3.03	2.87	3.29	3.00	2.77	2.35	2.23	3.03	3.13	3.90
Marshall.....	S. C.	3.98 <sub>7</sub>	4.27	4.29	5.07	4.29	4.20	5.06	4.90	3.94	4.00 <sub>f</sub>	4.03 <sub>h</sub>	4.26 <sub>c</sub>	3.33 <sub>e</sub>	3.81
Mendon.....	S. C.	3.00 <sub>7</sub>	3.29	6.13	4.93	3.74	3.40	3.16	1.93	2.10 <sub>d</sub>	2.32	1.86	2.89	3.46	3.60
Tecumseh.....	S. C.	3.45 <sub>5</sub>	2.76	4.45	3.89	3.29	2.67	3.23	1.80	1.81	1.97	2.13	2.10	2.63	3.19
Washington....	S. E.	3.43	3.15	3.74	4.29	3.50	3.32	3.44	2.92	2.50	2.21	2.67	2.79	3.03	3.35

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days.      b For 29 days.      c For 28 days.      d For 27 days.      e For 26 days.  
f For 25 days.      g For 23 days.      h For 22 days.

\* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 8, page 130. The full names of the divisions and the counties in each division are stated in Exhibit 1, page 59.

† Numbers in this column state the average annual relative amount of ozone by day for periods of years ending in each case with Dec. 31, 1883. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

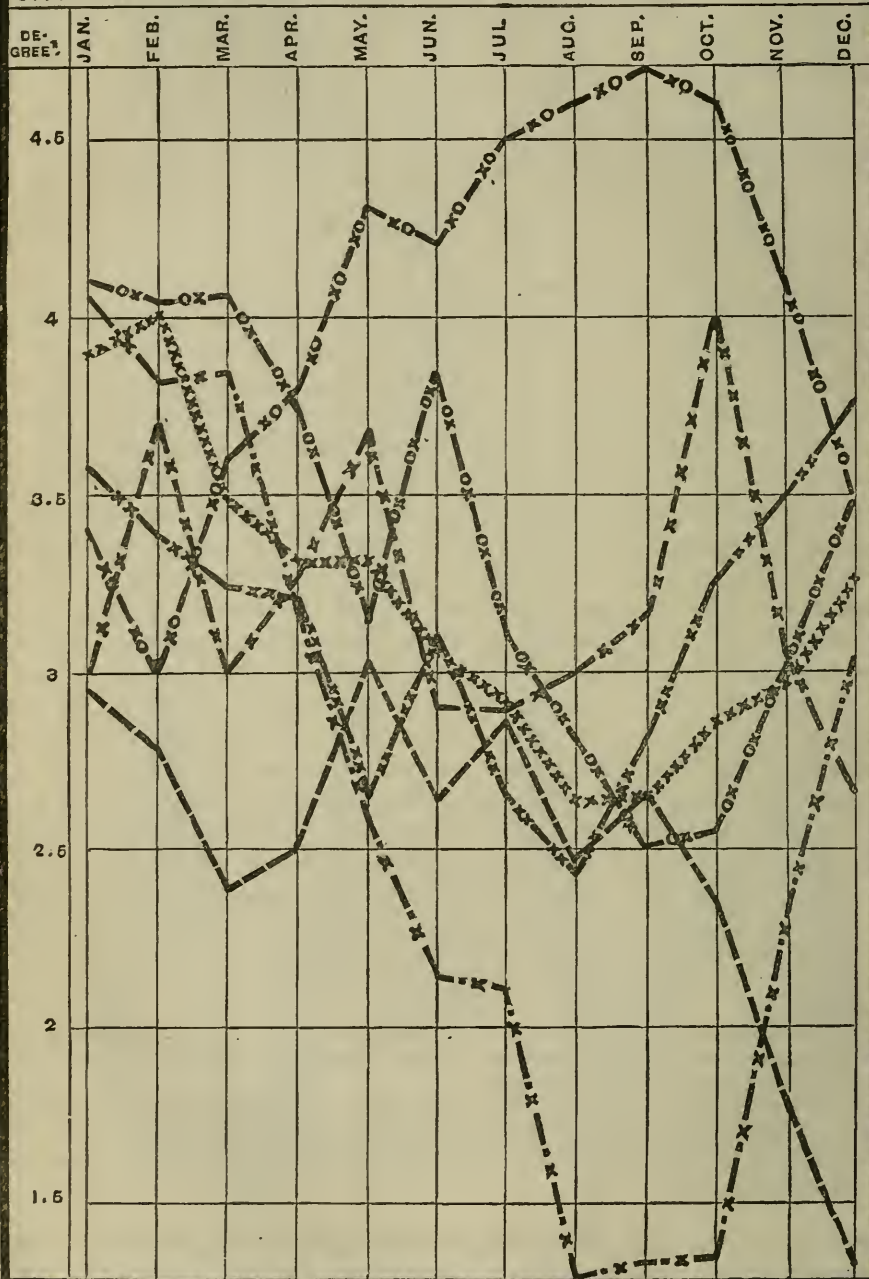
‡ The computations for Ann Arbor were made and furnished by the observer at that station, for Jan., Mar., Aug., and Oct.

Six lines in this table are graphically represented in Diagram VIII., page 172.



DIAGRAM VIII.—OZONE, AV. BY DAY, MONTHS IN 1883.

ATMOSPHERIC OZONE, FROM 7 A. M. TO 2 P. M.—AT STATIONS IN MICH.:  
 ANN ARBOR ——— x, GRAND HAVEN ——— xo; IONIA ——— ———,  
 LANSING ——— o x, REED CITY ——— x x, TRAVERSE  
 CITY ——— x; AVERAGE FOR 20 STATIONS: xxxxxxxx.



SCALE, 1 DEG. OF COLORATION (ON SCALE OF 10 DEGS.) TO 1.87 IN. VERTICALLY.  
 H. B. T., DEL. DES. BY H. B. B.

TABLE IX.—*Relative amount of Ozone in the Atmosphere at Night, during the Year, and during each Month of the Year 1883, at 20 Stations in Michigan,—as indicated by Averages of Observations made Nightly by Exposing Test-paper, prepared according to Schönbein's formula, from 9 P. M. to 7 A. M.,—Recorded according to a Scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by Ozone equals 10), by Observers for the State Board of Health, and for the U. S. Signal Service.\**

STATIONS IN MICHIGAN.* (Those of the U. S. Signal Service in Italics.)	Divi- sions of the State.*	DEGREES OF COLORATION OF TEST-PAPER—NIGHT OBSERVATIONS.													
		YEAR.		MONTHS, 1883.											
		Norm. †	1883.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 sta- tions.		-----	3.47	4.55	4.55	3.87	3.65	3.81	3.12	2.80	2.40	2.61	3.23	3.22	3.74
Marquette .....	U. P.	2.99 <sub>3</sub>	2.99	3.03	3.32	3.26	3.23	2.81	2.93	2.45	2.70	2.33	2.48	3.42	3.90
Essex .....	U. P.	2.96 <sub>2</sub>	3.38	3.40	4.20	3.90	4.00	3.40	4.00	3.40	3.50	2.70	3.10	3.00	2.00
Traverse City ..	N. W.	3.06 <sub>5</sub>	2.84	5.29	5.04	4.35	2.93	3.03	1.93	1.48	.90	1.00	1.52	2.97	3.68
Alpena .....	N. E.	3.28 <sub>4</sub>	4.12	5.58	4.89	4.13	3.83	3.74	4.37	4.06	3.32	4.03	3.90	3.47	4.10
Grand Haven ..	W.	3.33 <sub>5</sub>	3.98	3.60	3.30	3.30	3.80	5.20	4.80	4.10	4.00	4.40	4.50	3.80	3.00
Reed City .....	W.	3.56 <sub>1</sub>	3.61	4.39	5.04 <sub>d</sub>	4.06 <sub>a</sub>	3.53 <sub>c</sub>	3.87 <sub>f</sub>	3.33 <sub>d</sub>	3.06 <sub>c</sub>	2.06 <sub>c</sub>	2.13	3.03	3.80 <sub>b</sub>	5.06
Port Austin ..	B. & E.	3.91 <sub>3</sub>	3.91	5.45	5.37	4.30	4.46	3.43	3.04	3.11	3.07	3.37	3.35	3.66	4.32
Port Huron ..	B. & E.	2.80 <sub>7</sub>	2.53	2.32	2.50	2.52	2.30	2.32	2.47	2.97	1.90	2.37	2.58	2.87	3.29
Thornville ..	B. & E.	3.23 <sub>1</sub>	3.72	6.29	6.61	4.06	2.97	3.81	2.90	2.71	2.42	2.57	2.90	3.10	4.32
Ionia .....	C.	2.30 <sub>5</sub>	2.30	3.32	2.82	3.06	2.66	3.00	2.36	2.12	1.16	1.50	2.77	1.33	1.48
Lansing .....	C.	4.00 <sub>3</sub>	3.90	5.03	5.04	3.97	4.63	4.63	4.27	3.81	2.35	2.67	3.24	3.00	4.10
Winfield .....	C.	4.36 <sub>4</sub>	5.17	6.69	7.66 <sub>d</sub>	6.23 <sub>b</sub>	5.37 <sub>c</sub>	5.71	4.63 <sub>a</sub>	4.18 <sub>a</sub>	3.05	3.45 <sub>b</sub>	4.95 <sub>b</sub>	4.82 <sub>b</sub>	5.32 <sub>b</sub>
Ann Arbor .....	S. C.	2.44 <sub>2</sub>	3.45	3.00	3.70 <sub>d</sub>	4.00 <sub>b</sub>	4.43	4.29	2.86	2.83	3.00	2.97	4.00 <sub>b</sub>	3.33 <sub>c</sub>	3.03
Battle Creek ..	S. C.	2.54 <sub>2</sub>	2.61	3.45	2.48	2.62	2.97	2.71	2.40	2.13	2.26	2.47	2.97	2.29 <sub>d</sub>	2.55 <sub>d</sub>
Hillsdale .....	S. C.	3.49 <sub>7</sub>	3.59	4.00	4.57	4.10	3.57	3.87	3.23	3.03	2.87	2.93	3.52	3.47	3.89
Kalamazoo .....	S. C.	5.17 <sub>3</sub>	3.48	4.81	4.54	3.16	3.07	3.87	3.53	2.90	2.29	2.23	3.39	3.60	4.42
Marshall .....	S. C.	3.24 <sub>7</sub>	3.84	5.29	5.39	4.29	4.23	4.45	3.13 <sub>b</sub>	3.10 <sub>a</sub>	2.32 <sub>g</sub>	2.40 <sub>f</sub>	3.52 <sub>f</sub>	3.13 <sub>h</sub>	3.77 <sub>c</sub>
Mendon .....	S. C.	3.05 <sub>7</sub>	3.72	7.17	6.04	4.42	4.27	4.39	2.34	1.67 <sub>c</sub>	1.78	2.00	3.40	3.08	4.07
Tecumseh .....	S. C.	3.37 <sub>5</sub>	3.10	5.06	4.68	3.90	3.17	4.06	1.60	1.57	1.00	1.57	3.10	2.83	4.71
Washington ..	S. E.	3.24	3.06	3.84	3.80	3.81	3.48	3.47	2.27	1.39	1.95	2.03	3.31	3.47	3.87

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 25 days. f For 24 days. g For 23 days.

\* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 8, page 130. The full names of divisions, and the counties in each division are stated in Exhibit 1, page 59.

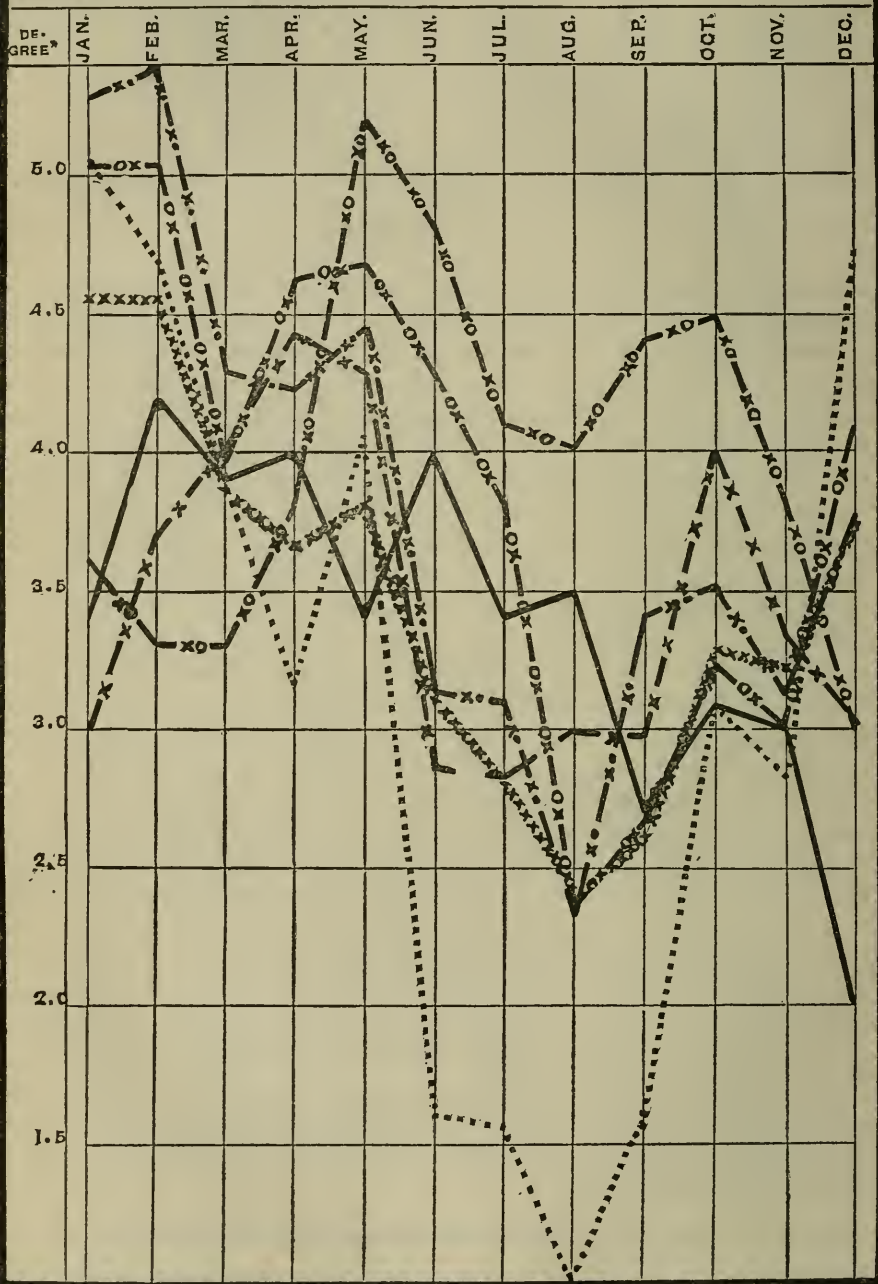
† Numbers in this column state the average annual relative amount of ozone by night for periods of years ending in each case with Dec. 31, 1883. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

NOTE.—The computations at Ann Arbor were made and furnished by the observer at that station, for Jan., Mar., Aug., and Oct.

Six lines in this table are graphically represented in Diagram IX, page 174.

DIAGRAM IX.—OZONE, AV. BY NIGHT, MONTHS IN 1883.

ATMOSPHERIC OZONE, FROM 9 P. M. TO 7 A. M.—AT STATIONS IN MICH.  
 ANN ARBOR ———— X ———— ESCANABA ———— X ———— GRAND HAVEN ———— X ————  
 LANSING ———— OX ———— MARSHALL ———— X ———— JECUMSEH ———— X ————  
 AVERAGE FOR 20 STATIONS xxxxxxxx.



\* SCALE: 1 DEG. OF COLORATION (ON SCALE OF 10 DEGS.) TO 1.45 IN. VERTICALLY.  
 H. B. T., DEL. DES. BY H. B. B.



EXHIBIT 31.—Average Amount of Atmospheric Ozone (Day), by Year and Months, in 1883, compared with Annual and Monthly Average for 1882 and for the seven Years, 1877-1883.\*

YEARS, ETC.	OZONE BY DAY—DEGREES OF COLORATION OF TEST-PAPER.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 7 years, 1877-83*.....	3.14	3.44	3.60	3.60	3.30	3.15	2.96	2.77	2.86	2.78	2.76	3.08	3.24
1882 (20 stat'ns*)	3.41	3.68	3.75	3.74	3.85	3.79	3.47	2.94	3.19	2.88	3.13	2.95	3.51
1883 (20 stat'ns*)	3.19	3.88	4.01	3.49	3.30	3.31	3.06	2.91	2.63	2.65	2.87	2.97	3.25
In 1883 <b>Great-</b> er than Av. for 7 yrs. '77-83.....	.05	.44	.41	-----	-----	.16	.10	.14	-----	-----	.11	-----	.01
In 1883 <b>Less</b> than Av. for 7 yrs. '77-83.....	-----	-----	-----	.11	-----	-----	-----	-----	.23	.13	-----	.11	-----
In 1883 <b>Great-</b> er than in 1882 In 1883 <b>Less</b> than in 1882.....	-----	.20	.26	-----	-----	-----	-----	-----	-----	-----	-----	.02	-----
	.22	-----	-----	.25	.55	.48	.41	.03	.56	.23	.26	-----	.26

\* Thornville, Kalamazoo, Mendon, Tecumseh for the 7 years, 1877-83; Battle Creek for the 4 years, 1877-80, and for 1882 and 1883; Niles for the 4 years, 1878-81; Nirvana for the 3 years, 1877-79; Coldwater and Agricultural College for 1877, 1878, and 1880; Otisville for the 3 years 1878-80, and for 1882; Alpena, Lansing, and Washington for the 5 years 1879-83; Petoskey and Woodmere Cemetery for 1878 and 1879; Marquette for 1881, 1882, and 1883; Grand Haven and Ann Arbor for the 4 years 1880-83; Five Lake and Ypsilanti for 1877; Ionia for 1880 and 1883; Adrian for 1880; Hudson and Maltory Lake for 1881; Escanaba, Reed City, Port Huron, and Marshall for the 3 years 1881-83; Harrisville for 1881 and 1882; Traverse City and Hillsdale for 1882 and 1883; Hastings and Parkville for 1882; Port Austin and Winfield for 1883.

EXHIBIT 32.—Average Amount of Atmospheric Ozone (Night), by Year and Months, in 1883, compared with Annual and Monthly Average for 1882 and for the seven Years, 1877-1883.\*

YEARS, ETC.	OZONE BY NIGHT—DEGREES OF COLORATION OF TEST-PAPER.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 7 years, 1877-83*-----	3.18	3.96	4.08	4.23	3.61	3.27	2.94	2.43	2.23	2.34	2.88	3.39	3.62
1882 (20 stat'ns*)	3.50	4.16	4.20	4.61	3.99	3.99	3.34	2.67	2.64	2.40	2.72	3.14	4.08
1883 (20 stat'ns*)	3.47	4.55	4.55	3.87	3.65	3.81	3.12	2.80	2.40	2.61	3.28	3.22	3.74
In 1883 <b>Greater</b> than Av. 7 yrs. 1877-83-----	.29	.59	.47	-----	.04	.54	.18	.37	.17	.27	.40	-----	.12
In 1883 <b>Less</b> than Av. 7 yrs. 1877-83-----	-----	-----	-----	.26	-----	-----	-----	-----	-----	-----	-----	.17	-----
In 1883 <b>Greater</b> than in 1882-----	-----	.39	.35	-----	-----	-----	-----	.13	-----	.21	.56	.08	-----
In 1883 <b>Less</b> than in 1882-----	.03	-----	-----	.74	.34	.18	.22	-----	.24	-----	-----	-----	.34

\* The stations represented in Exhibit 32 are the same as those represented in Exhibit 31, relative to day ozone, and named in the foot-note of that Exhibit, this page.

EXHIBIT 33.—*Special Ozone Observations made at the same time at three stations, (1) on the North side of the Michigan State Capitol building; (2) at the Office Window, southwest side; and (3) in the Yard, southwest of the building, with Test-paper prepared by Schönbein's Formula, for the Year, and for Months in the Year 1883, for the purpose of learning the influence that Furnace Gas and the building has on the Test-paper.*

MONTHS, 1883.*	7 A. M. to 2 P. M.			2 P. M. to 9 P. M.			9 P. M. to 7 A. M.		
	At Office, S. W. side.	In Yard, S. W. of Capitol.	At North end of Capitol.	At Office, S. W. side.	In Yard, S. W. of Capitol.	At North end of Capitol.	At Office, S. W. side.	In Yard, S. W. of Capitol.	At North end of Capitol.
Av. for year*.....	2.86	3.36	2.76	2.48	2.95	2.29	3.39	3.90	2.92
January.....	3.48	4.10	2.17	3.32	4.00	1.77	4.65	5.03	2.61
February.....	3.79	4.04	3.00	3.25	4.04	2.82	5.07	5.04	3.07
March.....	3.77	4.06	3.42	3.00	3.61	2.71	3.61	3.97	3.45
April.....	2.57	3.73	3.50	2.37	3.10	2.63	3.60	4.63	3.67
May.....	2.23	3.13	3.03	2.23	3.00	2.65	3.71	4.68	3.90
June.....	3.50	3.83	3.47	2.80	3.23	2.80	3.73	4.27	3.63
July.....	2.84	3.10	2.74	2.13	2.42	2.29	2.94	3.81	2.74
August.....	2.61	2.81	2.42	1.77	2.29	2.13	2.32	2.35	1.97
September.....	1.60	2.50	2.30	1.80	2.17	2.00	2.03	2.67	2.17
October.....	1.77	2.55	2.26	1.60	1.77	1.70	2.55	3.24	3.23
November.....	2.83	3.00	2.30	2.63	2.67	1.77	2.87	3.00	2.00
December.....	3.35	3.48	2.55	2.87	3.13	2.26	3.65	4.10	2.55

\* It is readily seen that the average degree of coloration for year and months, except February, in 1883, is higher in the yard than at the north or south sides of the building. The slips were more exposed to smoke from coal at north end of building, particularly during the winter months.

EXHIBIT 34.—Comparison of special Ozone Observations made on the North side of the Michigan State Capitol building, with the regular Observations made at the same time at the Southwest side of the building, also the direction of the prevailing wind at times of Observation. From records of Observations made at the Office of the State Board of Health, for the Year and for Months in the Year 1883.

MONTHS, 1883.	BY OBSERVATIONS AT 9 P. M. TO 7 A. M.— AVERAGE DEGREE OF COLORATION.						BY OBSERVATIONS AT 7 A. M. TO 2 P. M.— AVERAGE DEGREE OF COLORATION.						BY OBSERVATIONS AT 2 P. M. TO 9 P. M.— AVERAGE DEGREE OF COLORATION.					
	At S. W. side of	North end of Cap.	Direction from which the wind blew most times at 9 p. m.	S. W.	S. W.	Greater (+) or less (-) at north side.	At S. W. side of	North end of Cap.	Direction from which the wind blew most times at 7 a. m.	S. W.	Greater (+) or less (-) at north side.	At S. W. side of	North end of Cap.	Direction from which the wind blew most times at 2 p. m.	S. W.	Greater (+) or less (-) at north side.		
Av. Year.....	3.39	2.92	S. W.		S. W.	-0.48	2.86	2.76	S. W.		-0.10	2.48	2.29	S. W.		-0.19		
January.....	4.65	2.61	S. W.		S. W., S. E.	-2.04	3.48	2.17	S. W., S. E.		-1.31	3.32	1.77	S. W.		-1.55		
February.....	5.07	3.07	S. W.		S. W.	-2.00	3.79	3.00	S. W.		-0.79	3.25	2.82	W.		-0.13		
March.....	3.61	3.45	N. W.		S. W.	-0.16	3.77	3.42	S. W.		-0.35	3.00	2.71	W.		-0.29		
April.....	3.60	3.67	N. E., S. E.		S. E.	+0.07	2.57	3.50	S. E.		+0.93	2.37	2.63	S. E.		+0.26		
May.....	3.71	3.90	S. W., S. E.		W.	+0.19	2.23	3.03	W.		+0.80	2.23	2.65	W., S. W.		+0.42		
June.....	3.73	3.63	W., S. W.		S. W.	-0.10	3.50	3.47	S. W.		-0.03	2.80	2.89	W.		=		
July.....	2.94	2.74	W., S. W.		W.	-0.20	2.84	2.74	W.		-0.10	2.13	2.29	W.		+0.16		
August.....	2.32	1.97	N. W., S. W.		S. W.	-0.35	2.61	2.42	S. W.		-0.19	1.77	2.13	S. W.		+0.36		
September.....	2.03	2.17	N.		S. W.	+0.14	1.60	2.30	S. W.		+0.70	1.80	2.00	S. W.	N.	+0.20		
October.....	2.55	3.23	N. E.		N. E.	+0.68	1.77	2.26	N. E.		+0.49	1.60	1.70	N. E.		+0.10		
November.....	2.87	2.00	S. W.		S. W.	-0.87	2.83	2.30	S. W.		-0.53	2.63	1.77	S. W.		-0.86		
December.....	3.65	2.55	N. W.		S. W.	-1.10	3.35	2.55	S. W.		-0.80	2.87	2.26	S. W.	N. W.	-0.61		



EXHIBIT 35.—*Comparison of results of Observations for Ozone by means of Thallium Test-paper, with results of Observations by means of Test-paper prepared by Schönbein's Formula. Monthly Averages for the Year and for Months in the Year 1883, at the Office of the State Board of Health, Lansing, Mich.*

MONTHS, 1883.	AVERAGE DEGREE OF COLORATION.*								
	OBSERVATIONS FROM 9 P. M. TO 7 A. M.			OBSERVATIONS FROM 7 A. M. TO 2 P. M.			OBSERVATIONS FROM 2 P. M. TO 9 P. M.		
	With Schönbein's Test-paper.	With Thallium Test-paper.	Greater (+) or less (-) with Thallium than by Schönbein's Test-paper.	With Schönbein's Test-paper.	With Thallium Test-paper.	Greater (+) or less (-) with Thallium than by Schönbein's Test-paper.	With Schönbein's Test-paper.	With Thallium Test-paper.	Greater (+) or less (-) with Thallium than by Schönbein's Test-paper.
Av. Year.....	3.39	2.55	-0.84	2.86	2.22	-0.64	2.48	2.25	-0.23
January .....	4.65	3.13	-1.52	3.48	2.26	-1.22	3.32	2.45	-0.87
February .....	5.07	3.57	-1.50	3.79	3.29	-0.50	3.25	2.86	-0.39
March .....	3.61	3.48	-0.13	3.77	3.13	-0.64	3.00	3.10	+0.10
April .....	3.60	3.40	-0.20	2.57	2.67	+0.10	2.37	2.77	+0.40
May .....	3.71	3.10	-0.61	2.23	2.13	-0.10	2.23	2.23	=
June .....	3.73	2.37	-1.36	3.50	2.37	-1.13	2.80	2.40	-0.40
July .....	2.94	2.35	-0.59	2.84	2.26	-0.58	2.13	2.55	+0.42
August .....	2.32	2.03	-0.19	2.61	2.39	-0.22	1.77	2.58	+0.81
September.....	2.03	1.67	-0.36	1.60	1.53	-0.07	1.80	1.90	+0.10
October.....	2.55	1.58	-0.97	1.77	0.90	-0.87	1.60	1.06	-0.54
November.....	2.87	1.83	-1.04	2.83	1.73	-1.10	2.63	1.63	-1.00
December.....	3.65	2.03	-1.62	3.35	1.97	-1.38	2.87	1.52	-1.35

\* By a scale of 10 degrees of coloration,—Maximum=10.

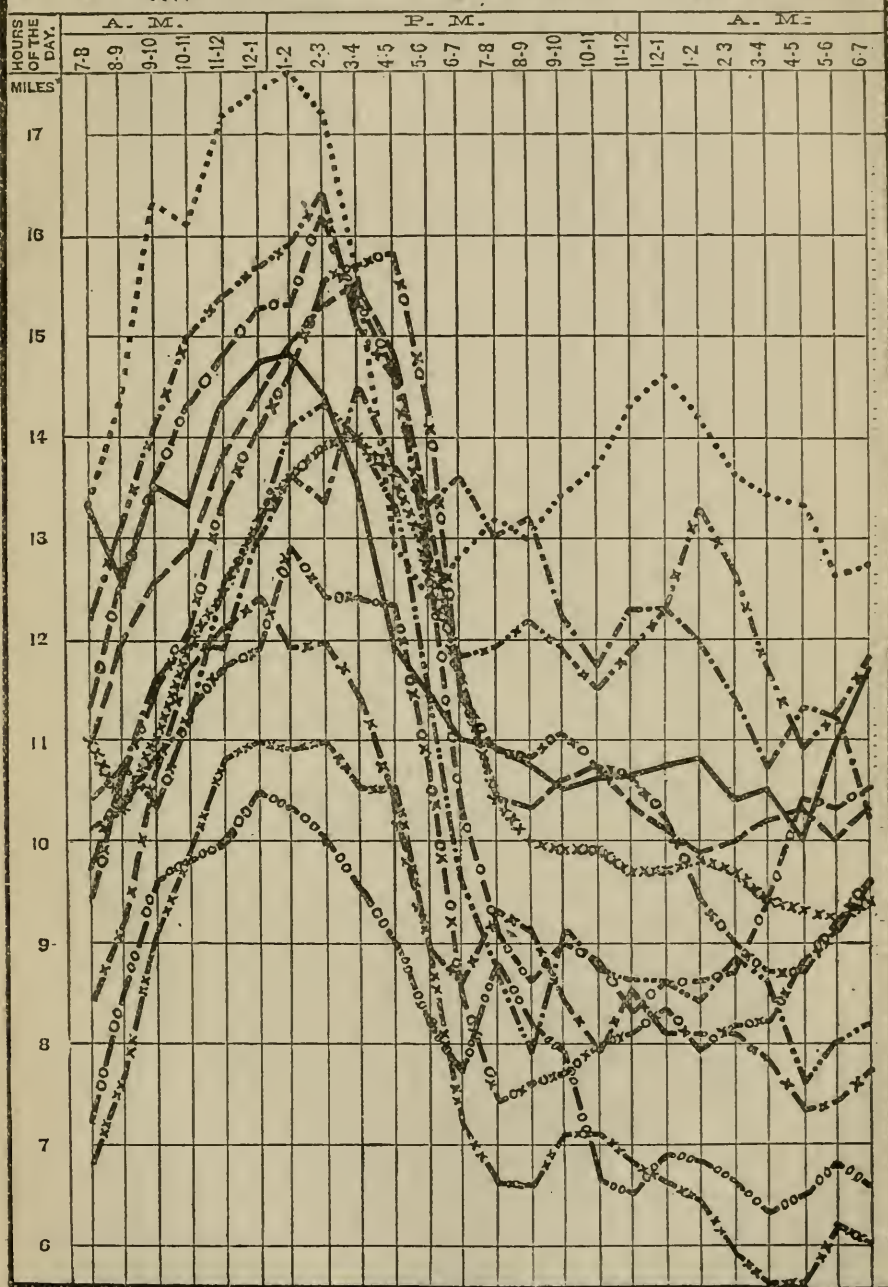
This exhibit—35—is in continuation of observations begun last year, for an account of which see pages 172 and 175 of Annual Report of Michigan State Board of Health for the year 1883.

EXHIBIT 36.—*Average Velocity of the Wind in Miles per Hour, by Months, for the 4 Years 1880-83, and comparisons of 1883 with this average and with the Year 1882. From Registers of the Robinson's Self-Registering Anemometer in the Office of the State Board of Health, State Capitol, Lansing, Michigan.*

YEARS, ETC.	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 4 years, 1880-83.....	10.2	10.9	12.6	12.2	11.7	10.3	9.3	8.5	7.2	8.6	8.7	11.7	10.6
1882.....	10.7	13.2	13.8	13.8	11.8	10.3	10.7	9.2	7.7	7.8	8.7	9.1	11.9
1883.....	11.0	12.2	13.1	11.6	11.5	11.9	9.7	10.3	8.0	8.1	9.4	14.4	12.0
In 1883 <b>Great-</b> er than Av. 4 years, 1880-83...	.8	1.3	.5	-----	-----	1.6	.4	1.8	.8	-----	.7	2.7	1.4
In 1883 <b>Less</b> than Av. 4 yrs, 1880-83.....	-----	-----	-----	.6	.2	-----	-----	-----	-----	.5	-----	-----	-----
In 1883 <b>Great-</b> er than in 1882. In 1883 <b>Less</b> than in 1882.....	.3	-----	-----	-----	-----	1.6	-----	1.1	.3	.3	.7	5.3	1.1
	-----	1.0	.7	2.2	.3	-----	1.0	-----	-----	-----	-----	-----	-----

DIAGRAM X.—VELOCITY OF WIND, BY HOURS AND MONTHS, 1883.

AV. MILES PER HOUR, FOR EACH HOUR OF THE DAY, AT STATE CAPITOL, LANSING, MICH.: JAN. ———, FEB. ———x, MAR. ———xo, APR. ———o, MAY ———, JUN. ———ox, JUL. ———, AUG. ———xx, SEPT. ———oo, OCT. ———x, NOV. ———, DEC. ———; AV. FOR 12 MONTHS xxxxxxx.



\*SCALE ONE MILE PER HOUR TO .53 IN. VERTICALLY.

H. B. T., DEL.

DES. BY H. B. B.

TABLE X.—Average velocity of the Wind, in Miles per Hour, for each Hour of the Day, by Months of the Year 1883.—Compiled from Registers of the Robinson's Self-Registering Anemometer, exposed above the roof of the Capitol, and registering in the office of the State Board of Health, Lansing, Michigan.

MONTHS.	1880.	1881.	1882.	Average 4 Yrs. 1880-83.	HOURS (1883), AND AVERAGE MILES PER HOUR.																								
					A. M.						P. M.						A. M.												
					7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	
Year...	9.4	9.6	10.7	10.2	11.0	10.3	11.0	12.0	12.5	13.2	13.6	13.9	14.0	13.6	12.8	11.6	10.4	9.9	9.9	9.7	9.7	9.8	9.7	9.4	9.3	9.2	9.4	9.6	
Jan....	11.0	7.3	13.2	10.9	12.2	10.4	10.7	11.6	12.0	11.9	13.0	13.6	13.3	14.5	13.7	13.3	13.6	13.0	13.2	12.2	11.7	12.3	12.3	12.0	11.4	10.7	11.3	11.2	10.2
Feb....	12.6	11.0	13.8	12.6	13.1	12.2	13.1	14.1	15.0	13.4	15.7	15.9	16.4	15.1	14.6	12.9	11.8	11.9	12.2	11.9	11.5	11.9	12.3	13.3	12.6	11.7	10.9	11.3	11.8
March.	12.8	10.4	13.8	12.2	11.6	9.7	10.6	11.5	12.1	13.4	14.1	14.6	15.5	15.7	15.8	14.3	11.4	10.9	10.8	11.1	10.7	10.6	10.2	9.4	9.0	8.7	8.7	9.2	9.6
April.	13.8	9.8	11.8	11.7	11.5	11.3	12.5	13.6	14.3	14.8	15.3	15.3	16.2	15.3	14.6	12.9	10.3	9.1	8.6	9.0	8.8	8.3	8.6	8.6	8.7	9.4	10.4	10.3	10.5
May...	10.4	8.4	10.3	11.9	11.0	12.0	12.6	12.9	13.8	14.4	14.9	15.3	15.5	14.8	13.2	11.7	10.4	10.3	10.6	10.7	10.3	10.1	9.9	10.0	10.2	10.3	10.0	10.3	10.3
June...	8.3	8.4	10.7	9.3	9.7	9.4	10.7	10.3	11.3	11.7	11.9	12.9	12.4	12.4	12.3	10.7	8.5	7.4	7.6	7.7	8.0	8.1	8.3	7.9	8.2	8.2	8.8	9.1	9.6
July...	6.5	8.1	9.2	8.5	10.3	10.1	10.3	10.8	11.2	12.6	13.1	14.1	14.3	14.0	13.3	11.5	9.6	8.7	7.9	9.1	8.7	8.6	8.6	8.4	8.8	8.6	7.6	8.0	8.2
Aug....	5.9	7.0	7.7	7.2	8.0	6.8	7.7	9.1	9.9	10.8	11.0	10.9	11.0	10.5	10.5	8.9	7.2	6.6	6.6	7.1	7.1	6.8	6.6	6.4	5.9	5.6	5.6	6.2	6.0
Sept...	8.1	10.3	7.8	8.6	8.1	7.2	8.5	9.6	9.8	10.0	10.5	10.3	10.0	9.5	9.0	8.2	7.7	8.8	8.2	7.9	6.6	6.5	6.9	6.8	6.6	6.3	6.5	6.8	6.6
Oct....	7.8	8.7	8.7	8.7	9.4	8.4	9.2	10.7	11.7	12.1	12.4	11.9	12.0	11.4	10.4	8.9	8.6	9.3	9.1	8.4	7.9	8.5	8.1	8.1	8.1	7.8	7.3	7.4	7.7
Nov...	8.6	14.6	9.1	11.7	14.4	13.3	14.3	16.3	16.1	17.2	17.4	17.6	17.2	15.5	12.9	12.4	12.8	13.2	13.0	13.4	13.7	14.3	14.6	14.2	13.6	13.4	13.3	12.6	12.7
Dec....	7.4	11.2	11.9	10.6	12.0	13.3	12.5	13.5	13.3	14.3	14.7	14.8	14.4	13.5	11.9	11.4	11.0	10.9	10.7	10.5	10.6	10.6	10.7	10.8	10.4	10.5	10.0	10.9	11.7

The statements in the fifth figure-column in Table X. of the average velocity of the wind in miles per hour, by months, during the year 1883, are graphically represented in Diagram XI., page 182, the remaining columns of Table X. for 1883 are graphically represented in Diagram X., page 179.



TABLE XI.—Average Velocity of the Wind in Miles per Hour for each of the Years 1882 and 1883, and for each Month of the Year 1883, at 8 Stations in Michigan. Computed from Registers of the Robinson's Self-Registering Anemometer,\* by Observers for the State Board of Health and for the U. S. Signal Service.

STATIONS IN MICHIGAN.†	Divisions of the State.	MILES, BY SELF-REGISTERING ANEMOMETERS.													
		YEAR.		MONTHS, IN 1883.											
		1882.	1883.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 stations.		9.6	9.9	10.9	10.9	10.3	9.9	10.7	8.8	8.7	7.9	8.3	9.3	12.6	10.8
Marquette.....	U. P.	8.7	9.1	10.8	10.1	9.6	7.9	8.8	9.2	7.1	8.0	7.8	8.1	10.6	11.0
Escanaba.....	U. P.	8.5	8.8	7.8	8.2	9.0	8.1	9.6	9.0	7.2	7.4	9.0	9.6	10.4	10.0
Alpena.....	N. E.	9.9	9.5	10.9	10.9	10.1	8.6	10.1	8.4	8.4	8.0	8.3	9.2	10.6	10.0
Grand Haven...	W.	11.3	11.6	12.4	13.3	10.6	11.6	11.5	9.6	11.0	9.2	9.9	11.0	16.4	12.9
Port Huron.....	B.&E.	8.7	9.8	10.0	10.2	11.0	10.4	11.9	8.7	8.6	7.6	7.7	8.9	13.0	9.7
Lansing.....	C.	10.7	11.0	12.2	13.1	11.6	11.5	11.9	9.7	10.3	8.0	8.1	9.4	14.4	12.0
Ann Arbor.....	S. C.	9.2	9.8	11.4	11.4	11.0	11.2	10.8	8.4	8.4	6.7	6.8	8.3	13.3	10.3
Detroit.....	S. E.	9.9	9.7	11.8	9.9	9.4	10.1	11.1	7.3	8.2	8.3	8.4	9.6	11.9	10.3

\* Gibbon's Anemometer was used at Ann Arbor.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 8, page 130.

Graphic representations of statements made in Table XI. are given in Diagram XI., page 182.

TABLE XII.—Number of Observations per Month (at 7 A. M., 2 P. M., and 9 P. M.,\* daily), at which the Wind was Blowing from each of the Eight Principal Points of Compass, during the Year and during each month of the Year 1883.—Average for 19 Stations in Michigan.†

POINTS OF COMPASS.	AVERAGE NUMBER OF OBSERVATIONS PER MONTH, 1883.												
	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observat'ns	91	93	84	93	90	93	90	92	93	90	93	90	92
Calm.....	7	6	5	7	6	5	7	8	10	7	6	5	6
North.....	7	3	3	11	9	10	7	5	7	9	10	4	5
Northeast.....	8	6	5	8	15	11	4	6	10	12	17	1	4
East.....	6	6	6	4	7	7	4	3	5	11	12	3	3
Southeast.....	9	12	7	7	11	12	12	6	7	11	11	7	7
South.....	10	9	8	8	9	10	13	13	8	8	10	16	13
Southwest.....	17	23	19	16	13	13	20	23	18	12	8	22	20
West.....	14	17	22	11	9	13	15	20	15	7	8	17	16
Northwest.....	12	10	11	20	10	11	8	8	13	13	10	15	18

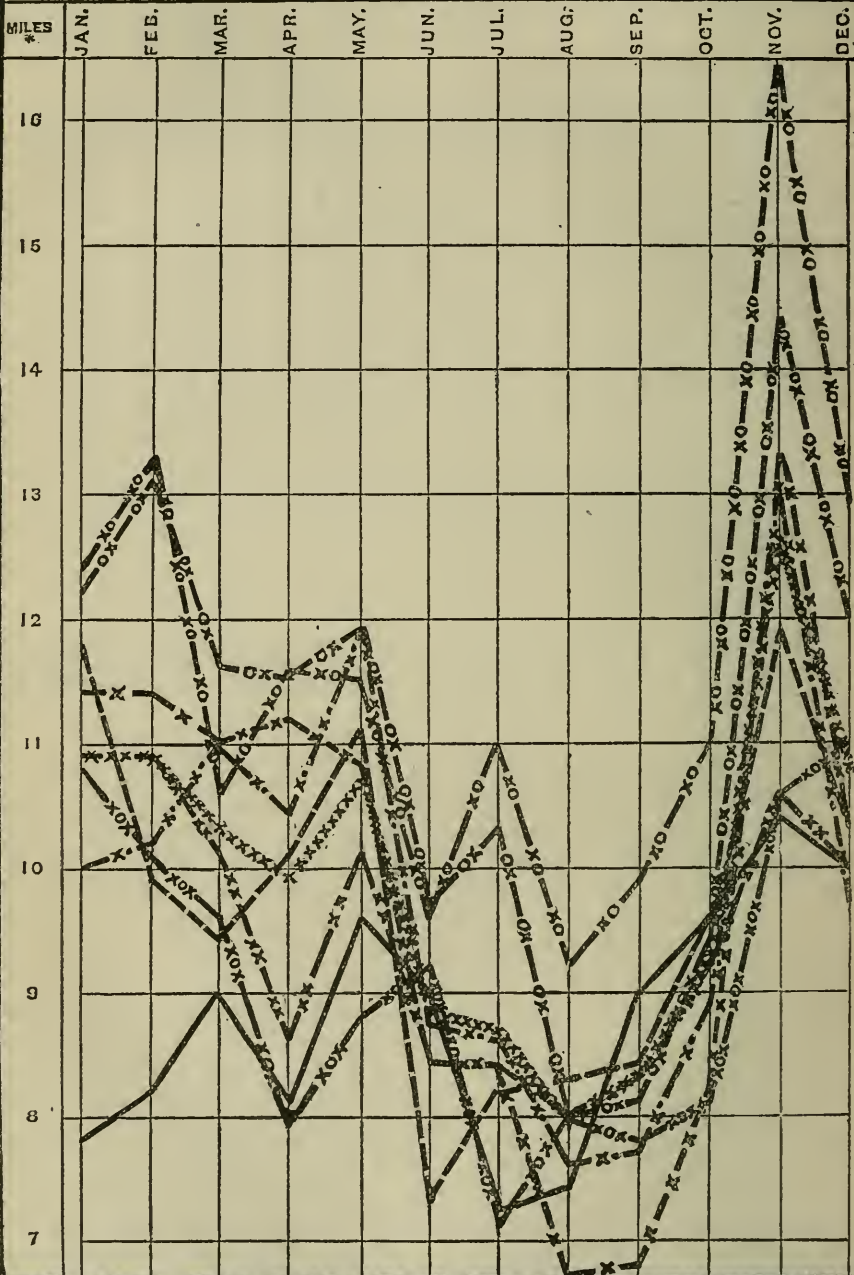
\* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time.

† The names of observers, their places of observation, and the counties and divisions of the State in which those places are situated are stated in Exhibit 8, page 130.

Graphic representations of statements in Table XII. are given in Diagram XIII., page 183.

DIAGRAM XI.—VELOCITY OF WIND, BY MOS., IN 1883.

AVERAGE MILES PER HOUR, BY REGISTERING ANEMOMETER, —AT STATIONS IN MICH.: ALPENA —xx, ANN ARBOR —x, DETROIT —, ESCANABA —, GRAND HAVEN —xo, LANSING —ox, MARQUETTE —xox, PORT HURON —xo; AV. FOR 8 STATIONS xxxxxxxx.



\*SCALE, ONE MILE PER HOUR TO .65 IN. VERTICALLY.

H. B. T., DEL.

DES. BY H. B. E.

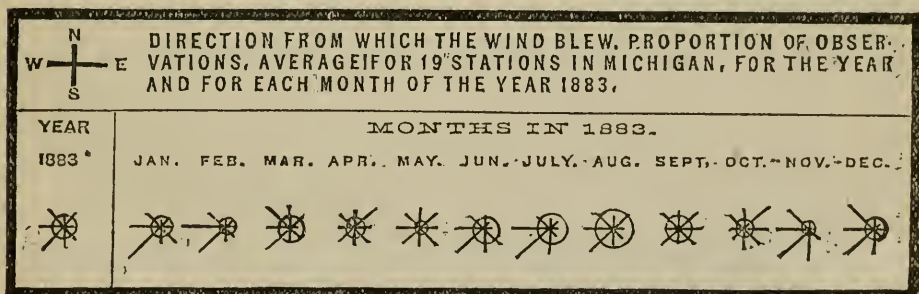
EXHIBIT 37.—DIRECTION OF WIND, 1878-83.—*Number of Observations per Month (at 7 A. M., 2 P. M., and 9 P. M.,\* Daily), at which the Wind was Blowing from the several (eight) Points of Compass.—Annual and Monthly Averages for the Six Years 1878-83, at Stations in Michigan.†*

POINTS OF COMPASS.	AVERAGE NUMBER OF OBSERVATIONS PER MONTH,—6 YEARS, 1878-83.												
	Annua- al Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations.	91	93	85	93	90	93	90	93	93	90	93	90	93
Calm.....	5	5	4	4	4	5	6	7	9	7	6	4	4
North.....	7	5	6	9	9	8	7	7	8	6	6	4	5
Northeast.....	8	6	7	8	12	12	9	8	11	8	8	5	5
East.....	6	5	5	8	8	8	6	4	7	6	6	4	5
Southeast.....	9	9	9	10	9	10	10	6	8	10	10	9	7
South.....	10	12	10	7	7	10	10	10	9	12	14	12	10
Southwest.....	18	22	17	13	13	17	16	20	18	18	18	20	23
West.....	15	16	15	15	13	13	14	18	13	13	13	18	20
Northwest.....	14	13	13	20	17	12	11	12	12	12	13	13	14

\* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time.

† At 12 stations in 1878; 16 in 1879; 19 in 1880; 19 in 1881; 21 in 1882; and 17 in 1883.

### DIAGRAM XIII.—WIND, DIRECTION, IN MICH., YEAR AND MONTHS, 1883.



\* SCALE. RADIUS .01 OF ONE INCH TO ONE OBSERVATION.  
H. B. T. DEL. DES. BY H. B. B.



TABLE XIII.—Average Number of Observations per Month for the Year 1883, at which the Wind was Blowing from each of the Eight Principal Points of the Compass, at each of 21 Stations in Michigan; also the Average for 19 of said Stations\*.

STATIONS IN MICHIGAN.* (Those of U. S. Signal Service in italics.)	Divisions of the State.†	AVERAGE NUMBER OF OBSERVATIONS PER MONTH IN 1883.									
		All Obs.	Calms	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 19 Stations.‡	-----	91	7	7	8	6	9	11	17	14	12
<i>Marquette</i> .....	U. P.	91	2	11	6	5	7	11	11	13	20
<i>Escanaba</i> .....	U. P.	91	6	19	3	3	8	21	7	10	13
Traverse City.....	N. W.	91	10	18	7	2	7	15	19	5	9
<i>Alpena</i> .....	N. E.	91	3	4	5	7	14	8	9	26	14
<i>Grand Haven</i> .....	W.	91	4	8	13	9	5	15	13	14	10
Reed City.....	W.	91	0	5	6	5	19	11	19	11	16
Port Austin.....	B. & E.	91	8	8	13	4	8	10	20	10	10
<i>Port Huron</i> .....	B. & E.	91	2	11	15	5	5	19	15	11	8
Thornville.....	B. & E.	91	6	1	9	4	10	1	18	19	25
Agricultural College.....	C.	91	18	5	8	8	5	7	19	15	6
Lansing.....	C.	91	1	6	11	4	11	9	22	15	13
Winfield.....	C.	91	3	4	9	6	13	13	27	6	10
Ann Arbor.....	S. C.	91	0	9	8	7	10	10	19	16	12
Battle Creek.....	S. C.	91	17	1	4	13	8	6	13	21	8
Hillsdale.....	S. C.	90	0	7	5	5	13	13	12	23	12
Kalamazoo.....	S. C.	91	0	6	10	3	7	11	31	8	16
Marshall.....	S. C.	91	10	2	12	8	8	7	25	10	10
Mendon.....	S. C.	84	21	4	8	6	6	8	16	7	8
Tecumseh.....	S. C.	90	15	6	8	8	3	8	21	14	8
<i>Detroit</i> .....	S. E.	91	4	8	10	9	8	11	15	16	10
Washington.....	S. E.	91	23	6	12	3	7	6	12	12	11

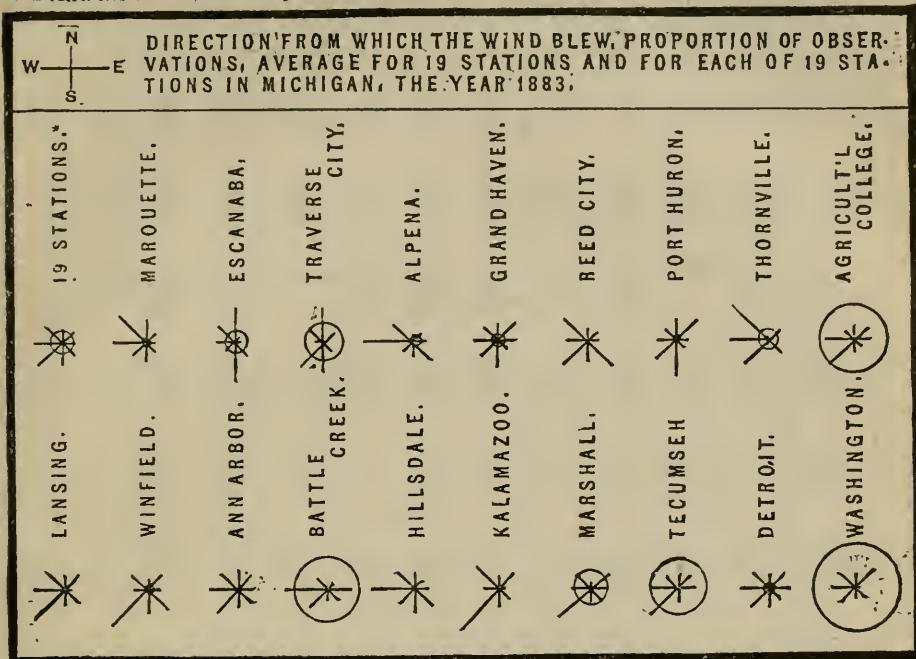
\* The names of observers, their places of observation, and the counties and divisions of the state, in which these places are situated, are stated in Exhibit 8, page 130.

† The full names of the divisions, and the counties in each division, are stated in Exhibit 1, p. 59

‡ This line is an average for only the stations for which statements, nearly complete, are given or every month of the year. It does not include Port Austin nor Mendon.

Graphic representations of statements in Table XIII. are given in Diagram XIV., page 185.

DIAGRAM XIV.—WIND, DIRECTION, AT STATIONS IN MICHIGAN, 1883.



H. B. T. DEL.

DES. BY H. B. B.

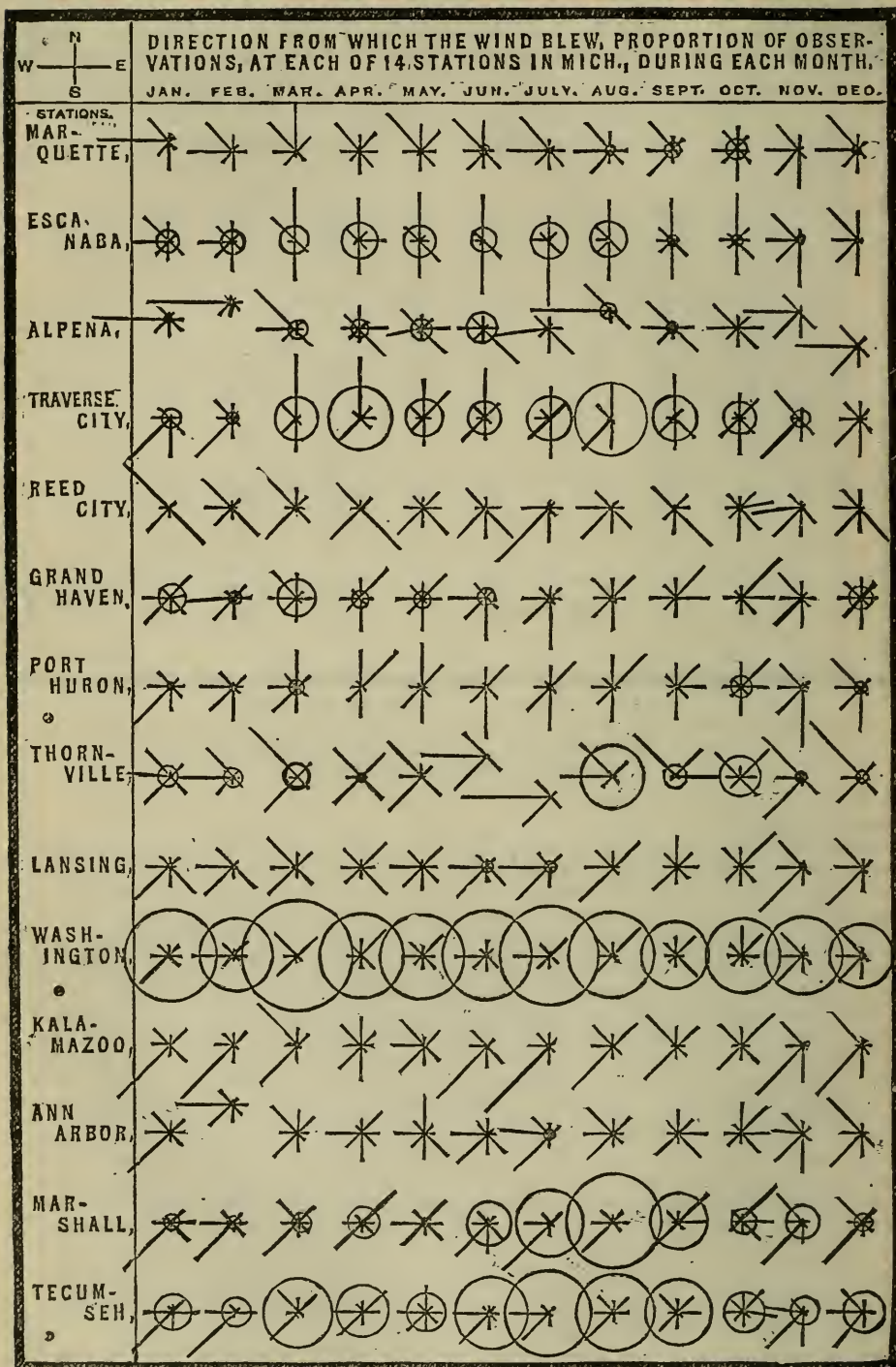
\*SCALE, RADIUS OF ONE INCH TO ONE OBSERVATION, NUMERICAL STATEMENTS CORRESPONDING TO LINES IN THIS DIAGRAM ARE GIVEN IN TABLE XIII, PAGE 184.

The construction and purport of the diagrams relating to direction of wind may be explained as follows:

In diagrams XII., XIII., and XIV., pages 136, 133, 135, relating to direction of the wind, the single figures or separate groups of lines are designed to indicate by the length of the lines the number and the proportion of regular observations at 7 A. M., 2 P. M., and 9 P. M.,\* daily, at which the wind was blowing from each of the eight principal points of compass at the places and for the periods of time stated in the margin; and by the direction of the lines on the page, the direction of the wind. Each figure consists of lines drawn to a common center from some or all of the following directions on the page, and indicating that at the times of observation the wind blew from points of the compass as follows: Lines toward the common center from the top of the page indicate observations that the wind was blowing from the north; from the right-hand side, observations that the wind was from the east; from the bottom of the page, that it was from the south; from the left-hand side, that it was from the west; from the upper left-hand corner, that it was from the northwest; from the upper right-hand corner, that it was from the northeast; from the lower right-hand corner, that it was from the southeast; from the lower left-hand corner, that it was from the southwest. The number of regular observations at which the wind was blowing from the direction denoted by a line is indicated by the length of that line, .01 of an inch being the unit or the length of line for one observation. The circles indicate calms, the number of regular observations at which there was no wind being denoted by the length of the radius of the circle drawn about the point of convergence of the lines for a given place or period of time, the length for one observation being, as before, .01 of an inch. Thus, by Diagram XII., page 136, or by Table XIV., page 187, it appears that at Thornville, in August, 1883, at 17 of the regular tri-daily observations for the month there was a calm; at 27 observations the wind was blowing from the west; at 25 from the northwest; at 12 from the northeast, etc. For convenient study, the top of these diagrams should be held toward the north. Definite numerical statements corresponding to these diagrams are given in Tables XII., XIII., and XIV., pages 181, 184, and 187.

\* At the stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time.

DIAGRAM XII.—WIND, DIRECTION, AT STATIONS, BY MONTHS, IN 1883.



SCALE RADIUS .01 OF ONE INCH TO ONE-OBSERVATION,  
H. B. T., DEL. DES. BY H. B. B.



TABLE XIV.—*Number of Observations for each Month of the Year 1883, at which the Wind was Blowing from each of the Eight Principal Points of Compass, at each of 21 Stations\* in Michigan; also the average for the 19 of said Stations from which nearly Complete Observations were received for the Year. (Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily.)†*

STATIONS IN MICHIGAN.* (Those of U.S. Signal Service in Italics)	JANUARY.										FEBRUARY.										MARCH.																					
	Total.	Calm.	N.	N. E.	E.	S. E.	S.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	W.	N. W.						
Av. for 19 Stations‡	93	6	3	6	6	12	9	23	17	10	84	5	3	5	6	7	8	19	22	11	93	7	11	8	4	7	8	16	11	20	93	1	27	11	1	6	3	10	12	22		
Marquette.....	93	0	3	2	1	5	16	11	39	16	84	0	8	4	7	2	10	9	24	20	93	1	27	11	1	6	3	10	12	22	93	1	27	11	1	6	3	10	12	22		
Escanaba.....	93	6	10	3	2	10	13	10	20	19	84	6	10	5	1	5	15	12	18	12	93	8	29	2	0	7	21	2	4	19	93	8	29	2	0	7	21	2	4	19		
Traverse City...	93	5	2	2	5	11	20	31	9	8	84	4	8	4	3	5	11	28	8	13	93	12	34	2	0	4	18	12	1	10	93	12	34	2	0	4	18	12	1	10		
Alpena.....	93	2	3	3	8	9	10	10	40	8	84	2	2	3	6	7	7	9	44	4	93	5	3	6	5	11	4	9	20	30	93	5	3	6	5	11	4	9	20	30		
Grand Haven...	93	8	1	16	8	11	8	13	15	8	81	4	3	9	9	2	10	15	26	6	93	10	13	4	7	3	13	10	14	19	93	10	13	4	7	3	13	10	14	19		
Reed City.....	93	0	1	4	1	26	5	17	5	34	84	1	0	3	5	2	21	5	12	11	22	93	0	11	8	3	10	1	23	6	31	9	93	0	11	8	3	10	1	23	6	31
Port Austin.....	93	2	5	3	6	7	15	36	10	9	84	1	2	4	5	6	7	41	6	12	93	5	11	15	0	1	14	21	12	14	9	93	5	11	15	0	1	14	21	12	14	
Port Huron.....	93	2	2	8	8	8	13	29	13	10	84	2	2	8	4	4	17	17	19	11	93	5	20	9	0	6	12	17	15	9	93	5	20	9	0	6	12	17	15	9		
Thornville.....	92	6	3	9	1	12	1	20	23	18	84	6	0	3	4	7	3	12	29	20	93	7	0	10	0	9	0	25	5	37	9	93	7	0	10	0	9	0	25	5	37	
Agri College....	92	18	0	2	12	9	2	32	16	1	81	13	0	8	6	3	3	22	20	6	92	19	10	11	1	1	7	18	14	11	9	92	19	10	11	1	1	7	18	14	11	
Lansing.....	93	2	5	6	3	19	12	26	13	7	84	1	1	3	3	16	6	21	20	13	93	0	7	11	0	12	6	22	13	22	93	0	7	11	0	12	6	22	13	22		
Winfield.....	93	4	1	9	4	16	21	26	5	7	84	0	0	5	4	12	14	28	8	13	93	2	4	11	5	14	11	23	4	19	93	2	4	11	5	14	11	23	4	19		
Ann Arbor.....	93	0	5	10	7	9	5	31	13	13	84	0	1	5	8	6	8	15	30	11	93	0	12	12	6	5	10	18	10	20	93	0	12	12	6	5	10	18	10	20		
Battle Creek....	93	17	4	0	11	15	6	12	23	5	84	8	2	2	10	7	3	12	31	9	85	5	1	4	16	7	4	11	24	13	93	5	1	4	16	7	4	11	24	13		
Hillsdale.....	93	0	6	4	5	21	7	9	33	8	84	0	1	2	8	13	7	12	34	7	93	0	3	9	3	10	8	10	25	25	93	0	3	9	3	10	8	10	25	25		
Kalamazoo.....	93	0	4	10	1	11	6	41	9	11	84	0	5	9	2	3	9	39	9	8	93	0	8	8	0	4	9	28	6	30	93	0	8	8	0	4	9	28	6	30		
Marshall.....	93	5	2	9	12	13	3	36	10	3	84	4	0	6	6	9	5	28	18	8	93	5	4	13	6	8	9	25	8	15	93	5	4	13	6	8	9	25	8	15		
Mendon.....	90	12	2	12	9	7	13	26	4	5	84	9	1	7	4	9	7	39	15	2	93	23	7	15	3	2	11	14	7	11	93	23	7	15	3	2	11	14	7	11		
Tecumseh.....	93	10	4	6	14	1	9	31	15	3	84	8	1	3	12	2	3	35	15	5	93	19	7	14	2	5	3	21	6	16	93	19	7	14	2	5	3	21	6	16		
Detroit.....	93	0	5	12	9	6	9	33	12	10	84	8	5	3	8	1	6	22	24	7	93	10	14	1	15	3	8	13	14	15	93	10	14	1	15	3	8	13	14	15		
Washington.....	93	25	5	8	5	7	3	23	9	8	84	20	3	10	6	3	3	8	23	8	93	30	2	14	0	4	4	15	7	17	93	30	2	14	0	4	4	15	7	17		

Diagram XII., page 186, gives 14 lines in this table, and is explained on page 183.

\* For names of observers, etc., see Exhibit 8, page 130. For names of divisions, etc., see Exhibit 1, page 53.

† With exceptions stated for U. S. Signal Service Stations in Table IV., page 131.

‡ This line includes only the 19 stations from which statements complete, or nearly complete, were received for every month of the year; it does not include Port Austin or Mendon.

TABLE XIV.—CONTINUED.—Direction of Wind, Months in 1883.—Observations at which the Wind was Blowing from Directions Named.

STATIONS IN MICHIGAN.* (Those of U.S. Signal Service in Italics.)	Divisions of the State.*	APRIL.						MAY.						JUNE.																									
		Total.	Calm.	N. E.	E.	S. E.	S. W.	W.	N. W.	Total.	Calm.	N. E.	E.	S. E.	S. W.	W.	N. W.	Total.	Calm.	N. E.	E.	S. E.	S. W.	W.	N. W.														
Av. for 19 stations†	-----	90	6	9	15	7	11	9	13	9	10	—	—	—	—	—	—	—	93	5	10	11	7	12	10	13	13	11	90	7	7	4	4	12	13	20	15	8	
<i>Marquette</i> .....	U. P.	90	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	90	3	16	1	4	12	9	12	10	23	
<i>Escanaba</i> .....	U. P.	90	10	23	5	13	6	17	4	3	9	93	9	26	4	5	14	19	0	6	10	90	7	24	1	1	12	23	3	7	7	7	7	7	7	7	7	7	
Traverse City...	N. W.	90	17	32	4	4	8	3	17	1	4	93	10	20	19	4	1	15	10	4	10	90	9	26	10	0	5	11	17	4	8	4	8	4	8	4	8	4	8
<i>Alpena</i> .....	N. E.	90	5	12	6	14	19	7	7	9	11	93	6	7	7	14	18	5	3	19	14	90	8	7	4	8	25	7	8	14	9	7	8	14	9	7			
<i>Grand Haven</i> .....	W.	90	5	10	21	6	5	17	9	11	6	93	5	8	17	9	3	17	11	14	9	90	5	5	5	5	2	8	22	15	20	8	5	2	8	22	15	20	
Reed City.....	W.	90	0	4	7	2	31	1	22	5	18	93	0	5	11	9	19	10	20	10	9	90	0	6	0	8	22	15	20	5	14	0	6	0	8	22	15	20	
Port Austin.....	B. & E.	88	12	8	29	6	6	13	11	1	2	92	7	6	28	7	8	13	10	7	3	89	11	9	8	4	11	14	12	17	3	3	8	4	11	14	12	17	
<i>Port Huron</i> .....	B. & E.	90	2	19	27	1	4	17	11	5	4	93	1	23	16	3	7	19	15	7	2	90	0	10	16	2	9	23	11	12	2	0	10	16	2	9	23	11	
Thornville.....	B. & E.	90	2	1	18	3	16	2	20	7	21	93	1	6	7	1	14	0	26	12	26	90	1	0	0	0	10	0	26	36	17	4	0	0	10	0	26		
Ag'l College.....	C.	89	17	4	20	5	6	3	19	9	6	92	17	4	15	9	5	8	13	14	7	90	17	4	5	6	7	9	22	16	4	4	5	6	7	9	22		
Laings.....	C.	90	0	4	17	6	20	6	13	11	13	93	1	3	14	7	12	13	15	18	10	90	3	4	5	3	14	9	23	21	8	5	3	4	5	3			
Winfield.....	C.	90	1	2	15	6	16	5	27	5	13	93	1	2	12	4	16	8	29	13	8	90	6	1	2	5	14	12	39	6	5	6	1	2	5	14	12		
Ann Arbor.....	S. C.	90	0	8	15	9	9	14	11	19	5	93	0	19	6	5	17	14	10	14	8	90	0	8	3	5	14	12	22	19	7	2	0	8	3	5			
Battle Creek.....	S. C.	90	8	1	10	21	11	8	12	13	6	93	10	0	10	13	10	4	23	15	3	90	14	1	2	5	10	14	23	19	2	9	0	6	2	0			
Hillsdale.....	S. C.	90	0	4	15	6	13	15	5	17	15	93	0	13	5	4	22	9	6	19	15	90	0	6	2	0	15	18	22	9	2	9	0	6	2	0			
Kalamazoo.....	S. C.	90	0	14	10	6	4	18	16	7	15	93	0	5	11	3	11	10	19	16	18	90	0	1	4	3	13	12	38	8	11	8	11	8	11	8			
Marshall.....	S. C.	90	0	14	10	6	4	18	16	7	15	93	0	5	11	3	11	10	19	16	18	90	0	1	4	3	13	12	38	8	11	8	11	8	11	8			
Mendon.....	S. C.	90	9	1	24	7	8	6	20	10	5	93	3	1	16	8	5	16	9	15	5	90	12	1	3	5	12	16	24	9	8	8	12	3	5	8			
Tecumseh.....	S. C.	90	20	3	21	2	7	15	13	1	8	90	16	4	8	5	16	9	15	5	12	88	26	2	2	5	7	8	18	12	8	8	12	3	5	7	8		
Detroit.....	S. E.	90	14	5	16	8	1	7	20	15	4	93	11	14	5	10	9	10	13	15	6	90	20	3	3	5	5	8	23	19	4	9	20	3	3	5	8		
Washington.....	S. E.	90	2	15	13	8	12	13	7	12	8	93	1	15	8	11	10	13	10	14	11	90	10	4	4	7	11	13	21	13	7	10	4	4	7	11	13		
Washington.....	S. E.	90	23	8	20	1	10	6	7	7	8	93	23	5	16	6	10	7	6	11	9	90	24	8	5	3	10	8	10	17	5	5	24	8	5	3	10	8	

\* †. For these references see foot-notes to this table on page 187. Port Austin and Mendon are not included in the average line.

NOTE.—Graphic representations of statements for 14 lines in this table are given in Diagram XII, page 183, which is explained on page 185.

TABLE XIV.—CONTINUED.—*Direction of Wind, Months in 1883.—Observations at which the Wind was Blowing from Directions Named.*

STATIONS IN MICHIGAN.* (Those of U.S. Signal Service in Italics.)	Divisions of the State.*	JULY.										AUGUST.										SEPTEMBER.									
		Total.					S. E.					S. W.					W.					N. W.					Calm.				
		N.	N. E.	E.	S. E.	S.	S. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
AN. for 19 stations†	-----	92	8	5	6	3	6	13	23	20	8	93	10	7	10	5	7	8	18	15	13	90	7	9	12	11	11	8	12	7	13
Marquette.....	U. P.	93	2	6	3	8	11	10	8	22	23	93	3	10	3	8	8	6	17	19	19	90	5	7	8	5	5	6	19	15	20
Escanaba.....	U. P.	93	10	13	6	0	9	36	1	11	7	93	10	21	1	2	10	22	10	7	10	90	3	23	3	4	11	20	8	8	10
Traverse City...	N. W.	93	12	17	12	0	1	21	15	8	7	93	20	19	0	0	3	16	23	2	10	90	13	23	6	0	15	16	11	4	2
Alpena.....	N. E.	92	0	6	3	7	18	13	6	29	10	93	4	0	3	3	14	6	3	42	18	90	3	2	5	10	16	5	10	19	20
Grand Haven...	W.	93	3	6	7	5	4	27	19	15	7	93	3	10	16	4	3	16	14	10	15	90	0	9	22	17	2	10	8	13	9
Reed City.....	W.	93	0	3	3	7	6	18	40	14	2	93	0	2	4	5	14	13	23	19	13	90	0	3	10	7	28	14	8	3	17
Port Austin.....	B. & E.	92	12	5	18	2	6	5	13	24	7	93	13	8	14	6	5	7	13	13	14	90	15	16	10	3	14	12	13	2	5
Port Huron.....	B. & E.	93	0	12	19	2	4	24	18	10	4	93	1	16	25	4	1	18	12	10	6	90	1	12	17	15	9	17	7	4	8
Thornville.....	B. & E.	93	1	0	4	0	8	0	21	48	11	93	17	0	12	1	4	0	7	27	25	90	7	0	19	24	2	0	4	3	31
Agri'l College...	C.	93	21	4	0	8	3	7	27	18	5	93	31	5	4	9	2	3	19	15	5	90	25	10	8	15	1	3	12	8	8
Lansing.....	C.	93	3	2	8	3	4	11	24	29	9	93	2	8	19	3	5	2	27	15	12	90	1	17	11	11	9	9	17	6	9
Winfield.....	C.	93	5	1	5	6	13	10	43	4	6	93	8	3	13	8	8	7	32	3	11	90	2	9	9	12	22	1	19	2	11
Ann Arbor.....	S. C.	93	3	5	6	3	3	7	27	12	9	93	0	8	12	6	7	7	20	14	13	90	0	13	11	16	18	5	16	4	7
Battle Creek...	S. C.	93	15	1	2	2	6	7	25	25	10	93	22	0	0	9	13	8	14	21	6	90	16	1	9	20	6	6	9	11	12
Hillsdale.....	S. C.	93	0	10	3	1	2	16	23	29	9	93	0	11	4	7	11	3	19	23	12	90	0	12	6	9	18	12	6	12	15
Kalamazoo.....	S. C.	93	0	5	4	0	3	10	50	13	8	93	0	6	17	2	5	6	32	11	14	90	0	9	15	5	7	6	24	2	22
Marshall.....	S. C.	93	18	0	9	0	3	7	36	14	6	93	26	3	8	8	6	0	23	11	8	90	16	5	21	15	4	1	17	3	8
Mendon.....	S. C.	90	26	4	2	1	1	5	27	10	14	71	26	7	0	8	2	0	12	8	8	80	30	6	7	13	1	2	9	4	8
Tecumseh.....	S. C.	81	23	1	4	0	0	7	20	21	5	93	21	6	11	7	2	4	21	10	11	90	18	6	12	12	3	8	11	4	13
Detroit.....	S. E.	93	6	7	9	6	4	17	19	20	5	93	2	7	18	4	5	14	10	12	15	90	1	7	19	15	8	7	8	15	10
Washington.....	S. E.	93	27	2	13	0	6	7	10	20	8	93	23	7	21	2	4	0	13	9	14	90	18	11	15	4	16	6	5	6	9

\*. 1, 1. For these references see foot-notes to this table on page 187. Port Austin and Mendon are not included in average line.  
 NOTE.—Graphic representations of statements for 14 lines in this table are given in Diagram XII., page 186, which is explained on page 185.



TABLE XIV.—CONCLUDED.—*Direction of Wind, Months in 1883.—Observations at which the Wind was Blowing from Directions Named.*

STATIONS IN MICHIGAN,* (Those of U. S. Signal Service in Italics.)	Division of the State.*	OCTOBER.							NOVEMBER.							DECEMBER.									
		Total.		N. E.		E. S. E.		S. W.		W.		N. W.		Total.		N. E.		E. S. E.		S. W.		W.		N. W.	
		Calm.	N.	N. E.	E. S. E.	E. S.	W.	N. W.	W.	N. W.	W.	N. W.	W.	N. W.	Calm.	N.	N. E.	E. S. E.	E. S.	S. W.	W.	N. W.	W.	N. W.	
Av. for 19 Stations†	-----	93	6 10	17 12	11 10	8	10	8	10	90	5 4	1 3	7 16	22	17	15	92	6 5	4 3	7 13	20	16	18		
<i>Marquette</i> .....	U. P.	93	6 13	8 6	9 16	10	13	12		90	1 7	2 0	5 20	19	18	93	3 7	5 1	5 12	12	24	24			
<i>Escanaba</i> .....	U. P.	93	3 25	8 6	12 17	6	10	6		90	2 5	1 2	3 24	16	17	20	93	1 15	0 3	2 19	17	14	22		
<i>Traverse City</i> ...	N. W.	93	9 13	14 3	11 20	15	3	5		90	5 6	1 0	10 12	30	6	20	93	1 11	7 3	8 20	19	11	13		
<i>Alpena</i> .....	N. E.	93	1 6	8 12	15 9	7	16	19		90	0 2	1 0	12 14	19	30	12	93	0 1	5 1	8 11	20	33	14		
<i>Grand Haven</i> ...	W.	93	1 6	29 19	11 9	2	10	6		90	0 9	3 7	5 15	20	12	19	93	7 10	10 8	6 16	14	11	11		
<i>Reed City</i> .....	W.	93	0 6	11 18	15 17	8	8	10		90	0 3	3 2	10 15	21	27	9	93	0 10	0 1	23 13	19	14	13		
<i>Port Austin</i> .....	B. & E.	92	9 14	23 4	15 6	9	6	6		87	3 6	1 0	9 5	35	6	22	93	2 7	7 0	4 14	30	12	17		
<i>Port Huron</i> .....	B. & E.	93	6 13	21 14	6 14	6	8	5		90	0 1	4 3	3 31	18	13	17	93	4 2	6 3	4 23	15	14	22		
<i>Thornville</i> .....	B. & E.	93	11 5	21 9	13 0	8	8	18		90	3 0	0 0	11 3	29	14	30	93	4 0	9 0	11 0	18	11	40		
<i>Agri College</i> ....	C.	93	16 11	10 21	7 7	8	10	3		90	15 2	2 0	5 15	21	20	10	92	12 6	6 2	7 14	16	19	10		
<i>Lansing</i> .....	C.	93	1 10	26 7	11 10	11	3	14		90	1 5	1 1	5 10	34	14	19	93	0 3	6 2	4 15	28	14	21		
<i>Winfield</i> .....	C.	93	5 9	16 17	7 15	12	3	9		90	1 5	1 1	10 34	21	10	7	93	1 7	6 4	9 20	30	3	13		
<i>Ann Arbor</i> .....	S. C.	93	0 16	19 14	13 6	10	9	6		90	6 7	1 4	5 21	21	17	14	93	1 5	1 3	9 12	24	11	27		
<i>Battle Creek</i> ....	S. C.	92	21 2	11 29	3 3	7	11	5		90	31 0	0 6	2 1	8	27	15	93	40 0	3 7	4 2	4	28	5		
<i>Hillsdale</i> .....	S. C.	93	0 13	12 7	20 10	6	13	12		90	0 4	6 2	6 28	16	28	6	83	0 3	1 2	6 19	15	24	13		
<i>Kalamazoo</i> .....	S. C.	93	0 9	24 4	12 7	17	4	16		90	0 2	2 3	3 19	36	8	17	93	0 3	2 4	5 17	35	3	24		
<i>Marshall</i> .....	S. C.	93	7 4	26 16	14 5	8	6	7		90	9 1	1 4	3 11	32	9	20	93	5 1	8 6	8 8	30	8	19		
<i>Mendon</i> .....	S. C.	77	19 5	15 13	9 4	3	5	4		64	19 1	0 1	4 9	11	10	9	85	26 2	3 2	5 17	16	5	9		
<i>Teconseh</i> .....	S. C.	93	11 11	16 18	4 7	7	10	9		90	8 3	0 3	3 17	26	21	9	93	11 6	2 6	1 8	24	19	16		
<i>Detroit</i> .....	S. E.	93	2 11	19 9	14 5	5	9	19		90	2 3	4 8	21 12	10	23	7	93	0 8	6 6	4 12	26	21	10		
<i>Washington</i> ....	S. E.	93	20 16	16 8	5 6	7	7	8		90	21 4	1 2	5 8	20	13	16	93	17 5	2 1	5 12	19	14	18		

\*<sub>1</sub>, † For these references see foot-notes to this table on page 187. Port Austin and Mendon are not included in average line.

NOTE.—Graphic representations of statements for 11 lines in this table are given in Diagram XII., page 186, which is explained on page 185.

## DIAGRAMS RELATING TO METEOROLOGICAL CONDITIONS.

Most of the diagrams in this paper are to be read by tracing each irregular line across the diagram from left to right, and noting at what point it intersects each of the perpendicular lines having the name of a month at the top. What station is represented by the irregular line may be learned from the head of the diagram. The degree or value denoted by the intersection may be learned by referring to the figures in the left-hand column. Thus in Diagram I, page 143, relating to average temperature in 1883, tracing the line— $\times \times$ , representing Marquette, it may be seen that the average temperature at Marquette was, in January, about  $12^{\circ}$ , in February  $15^{\circ}$ , in April about  $37^{\circ}$ , in July about  $62^{\circ}$ , in October about  $48^{\circ}$ , etc. Definite numerical statements of the average temperature for each month at each station may be found in Table I., page 142, and accompanying each diagram is a table giving exact numerical statements for the conditions represented. The average line given in each table is in the corresponding diagram represented by an  $\times$  line, thus  $\times \times \times \times \times \times$ . The lines in the diagrams give more ready general comparisons of stations with each other, or of months with each other, than is possible from the mere numerical statements. By Diagram II, page 148, it appears at a glance that the average daily range of temperature at Marshall, in 1883, was, from July to September, inclusive, slightly higher than at any other of the ten stations represented in that diagram, and from April to October, inclusive, was considerably lower at Grand Haven. The marked agreement in the course of the lines in Diagram I., page 143, representing mean monthly temperature at six stations, and also that the agreement is closer in the last four months of the year than in earlier months, appear at once on reference to the diagram. The resemblance between the lines in Diagram I., relating to mean temperature by months in 1883, and those in Diagram III., page 152, relating to absolute humidity of the atmosphere for the same periods, is apparent. By Diagram X., page 179, it appears that in every month of the year the highest velocity of the wind (on an average for the month) is reached between 12 M. and 4 P. M., and that the lowest velocity occurs in the latter part of the night or in early morning, and that in 1883, at Lansing, the months of most wind were February and November. By reference to Diagram XI., page 182, it may be seen that at other stations in Michigan where records of actual miles of wind traveled were kept, January, February, and November were, in 1883, the months of greatest wind. In 1882, as observed at Lansing, February and March were the months of most wind, and in 1881 November was the month of greatest wind. These statements illustrate the reading of the diagrams for any use it may be desired to make of the tables and diagrams. The three diagrams relating to direction of wind are differently constructed, and the manner of reading them is explained on page 185 of this article.

**EXHIBIT 38.**—*Comparison of the Average Atmospheric Pressure during the Year and during each Month of the Year 1883, with Averages for the 8 Years, 1875-82, and for the Year 1882. Corrected for Temperature and for Instrumental Error. Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

YEARS, ETC.	AVERAGE ATMOSPHERIC PRESSURE.—INCHES OF MERCURY.												
	Annua- l Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 yrs. 1875-82.....	29.049	29.070	29.044	28.989	29.000	29.053	29.001	29.054	29.056	29.096	29.073	29.078	29.072
1882.....	29.004	29.134	29.041	29.008	29.088	29.065	28.959	29.096	29.062	29.186	29.112	29.175	29.112
1883.....	29.004	29.116	29.239	29.046	29.029	28.994	28.985	29.059	29.141	29.149	29.145	29.115	29.111
In 1883 <b>Great- er</b> than Av. for 1875-82.....	.045	.046	.195	.057	.029	-----	-----	.005	.085	.053	.072	.037	.039
In 1883 <b>Less</b> than Av. for 1875-82.....	-----	-----	-----	-----	-----	.059	.016	-----	-----	-----	-----	-----	-----
In 1883 <b>Great- er</b> than in 1882	=	-----	.198	-----	-----	-----	.026	-----	.079	-----	.033	-----	-----
In 1883 <b>Less</b> than in 1882...	-----	.018	-----	.052	.059	.071	-----	.037	-----	.037	-----	.060	.001

**EXHIBIT 39.**—*Average Atmospheric Pressure, by Year and Months, in 1883, compared with Annual and Monthly Average for 1882, and for the 7 Years, 1877-83.*

YEARS, ETC.	AVERAGE ATMOSPHERIC PRESSURE.—INCHES OF MERCURY.												
	Annua- l Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 7 years, 1877-83*-----	29.147	29.196	29.197	29.131	29.096	29.127	29.064	29.107	29.128	29.177	29.182	29.184	29.170
1882*-----	29.138	29.186	29.121	29.149	29.153	29.123	29.001	29.118	29.112	29.202	29.134	29.224	29.135
1883*-----	29.189	29.221	29.328	29.145	29.125	29.069	29.072	29.140	29.233	29.238	29.275	29.182	29.205
In 1883 <b>Great- er</b> than Av. 7 yrs.—1877-83....	.042	.025	.131	.014	.029	-----	.008	.033	.105	.061	.093	-----	.035
In 1883 <b>Less</b> than Av. 7 yrs. —1877-83.....	-----	-----	-----	-----	-----	.028	-----	-----	-----	-----	-----	.002	-----
In 1883 <b>Great- er</b> than in 1882	.051	.035	.207	-----	-----	.024	.071	.022	.121	.036	.041	-----	.070
In 1883 <b>Less</b> than in 1882....	--- --	-----	-----	.004	.028	-----	-----	-----	-----	-----	-----	.042	-----

\* Kalamazoo for 6 years 1877-82; Battle Creek for 1877-80, 1882; Detroit for 6 years 1878-83; Woodmere Cemetery (near Detroit) for 3 years 1877-79; Mendon for 1877, 1878, and 1881-83; Marquette, Alpena, Grand Haven, Port Huron, and Lansing for 5 years 1879-83; Benton Harbor for 1877, 1878; Ypsilanti for 1877, 1879; Agricultural College for 1877, 1881-83; Otisville for 1878-80, and 1882; Tecumseh and Washington for 1879, 1880, 1882, 1883; Nirvana for 1879, and in 1880 to April 25 inclusive; Reed City in 1880 after April 25, and 1881-83; Thornville for 1880, 1881; Escanaba for 1880, 1882, 1883; Ann Arbor for 1881-83; Traverse City and Hillsdale for 1882, 1883; Harrisville and Hastings for 1882; Port Austin and Marshall for 1880.



TABLE XV.—Average Daily Range of Atmospheric Pressure (as determined from three daily observations\*), for the Year 1883, for seventeen and at each of seventeen Stations in Michigan.—Stations arranged in order by Latitude, those farthest North first.

STATIONS† IN MICHIGAN. (Those of U. S. Signal Service in Italics.)	Average.		AVERAGE DAILY RANGE OF BAROMETER,—YEAR AND MONTHS, 1883.												Latitude\$	Eleva- tion above Sea.§ (Feet)
	1882.	1883.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		
Average for } 17 Stations. }	-----	.228	.333	.337	.283	.179	.199	.157	.129	.128	.196	.226	.306	.265	43°21'	755.11
Average for } 16 Stations‡.	-----	.229	.335	.338	.285	.180	.200	.157	.130	.129	.198	.226	.309	.266	43°26'	731.12
Marquette.....	.224	.340	.340	.324	.297	.196	.188	.155	.146	.169	.193	.236	.334	.297	46°33'	638.07
Escanaba.....	.223	.340	.355	.332	.296	.193	.201	.159	.139	.153	.191	.238	.333	.289	45°46'	594.69
Alpena.....	.241	.352	.353	.298	.198	.209	.162	.149	.137	.200	.226	.328	.274	45°57'	587.90	
Traverse City.....	.218	.236	.342	.352	.288	.172	.189	.154	.136	.144	.206	.238	.317	.298	44°45'	558.00
Port Austin.....	.241	.389	.372	.296	.217	.218	.177	.146	.124	.192	.239	.258	.267	44°	478.00	
Reed City.....	.214	.229	.355	.325	.293	.165	.192	.161	.130	.127	.218	.217	.313	.250	43°44'	1,016.00
Grand Haven.....	.204	.224	.328	.325	.284	.173	.192	.149	.126	.125	.200	.221	.310	.253	43°58'	595.30
Port Huron.....	.223	.317	.336	2-4	.169	.197	.172	.118	.117	.191	.223	.259	.261	42°58'	610.00	
Agr'l College.....	.214	.328	.316	.265	.158	.157	.146	.118	.105	.186	.215	.300	.242	42°44'	820.00	
Lansing, S. B. H.....	.202	.225	.339	.335	.281	.166	.197	.147	.125	.123	.199	.224	.310	.256	42°44'	900.00
Washington.....	.231	.330	.362	.293	.184	.269	.154	.124	.124	.208	.225	.301	.261	42°40'	746.33	
Detroit.....	.224	.312	.338	.289	.179	.202	.143	.114	.124	.184	.234	.296	.274	42°20'	602.60	
Ann Arbor.....	.196	.222	.313	.332	.281	.179	.194	.156	.130	.112	.218	.212	.280	.262	42°17'	930.00
Marshall.....	.229	.320	.343	.265	.174	.202	.166	.137	.126	.195	.253	.327	.256	42°17'	885.00	
Mendon.....	.224	.315	.328	.269	.181	.212	.144	.112	.124	.198	.208	.349	.252	42°07'	871.00	
Tecumseh.....	.199	.229	.323	.336	.279	.182	.215	.174	.132	.134	.186	.230	.293	42°1'	835.00	
Hillsdale.....	.176	.208	.299	.320	.254	.160	.187	.143	.117	.110	.173	.216	.268	.247	41°55'	1,139.00

TABLE XVI.—Range of Atmospheric Pressure (as determined from 3 daily observations\*) for the Year and for each month of the Year 1883, at 17 and at each of 17 Stations in Michigan.—Stations named in order by Latitude, those farthest North first.

STATIONS† IN MICHIGAN. (Those of U. S. Signal Service in Italics).	Average.		RANGE OF BAROMETER.—YEAR AND MONTHS, 1883.												
	1882.	1883.	Av. Mo.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 17 stations§§.	-----	1.878	1.461	1.668	1.498	1.647	1.527	1.213	1.367	1.166	1.039	1.414	1.878	1.597	1.513
Av. for 17 stations¶.	-----	1.351	.917	1.100	.989	1.144	.814	.725	.804	.635	.570	.921	1.299	1.067	.932
Av. for 16 stations‡.	-----	1.357	.922	1.107	.992	1.159	.823	.729	.804	.638	.577	.929	1.303	1.072	.937
<i>Marquette</i> .....	1.423	1.598	1.020	1.300	1.060	1.455	.947	.877	.677	.737	.905	.857	1.263	1.126	1.038
<i>Escanaba</i> .....	1.367	1.429	.999	1.336	1.102	1.299	.916	.820	.747	.732	.791	.918	1.255	1.059	1.069
<i>Alpena</i> .....	1.457	.993	1.193	1.100	1.252	1.001	.695	.845	.669	.697	1.065	1.368	1.064	.969	
Traverse City.....	1.556	1.400	.972	1.260	.992	1.218	.977	.750	.754	.713	.699	.907	1.393	1.021	1.018
Port Aus in.....	1.397	.953	1.100	1.001	1.178	1.047	.784	.840	.641	.555	1.040	1.334	1.014	.879	
Reed City.....	1.440	1.355	.888	1.065	.931	1.144	.840	.684	.735	.653	.524	.904	1.181	1.000	.969
<i>Grand Haven</i> .....	1.491	1.236	.917	1.090	1.016	1.104	.875	.692	.763	.68	.561	.895	1.220	1.086	1.068
<i>Port Huron</i> .....	1.419	.921	1.041	.943	1.163	.763	.613	1.074	.579	.498	1.007	1.419	1.023	.927	
Agricultural College.....	1.299	.881	1.080	.940	1.057	.683	.657	.813	.601	.488	.969	1.299	1.159	.969	
Lansing, S. B. of H.....	1.454	.729	.877	1.024	.951	1.117	.728	.682	.758	.583	.534	.913	1.279	1.084	.868
Washington.....	1.385	.905	1.090	.919	1.118	.767	.689	.795	.622	.535	.954	.954	1.069	.922	
<i>Detroit</i> .....	1.351	.898	.991	.939	1.124	.722	.711	.852	.586	.500	.936	1.351	1.124	.941	
Ann Arbor.....	1.421	1.308	.873	.997	.932	1.089	.756	.689	.793	.592	.491	.956	1.368	.982	.892
Marshall.....	1.264	.881	1.009	1.012	1.068	.684	.725	.750	.619	.552	.865	1.264	1.134	.887	
Mendon.....	1.257	.886	1.095	1.041	1.070	.760	.849	.745	.591	.467	.825	1.221	1.114	.857	
Tecumseh.....	1.427	1.283	.892	1.066	.986	1.083	.695	.753	.918	.595	.467	.967	1.283	1.108	.901
Hillsdale.....	1.241	1.251	.832	.990	.956	.915	.669	.660	.805	.589	.462	.806	1.239	.995	.853

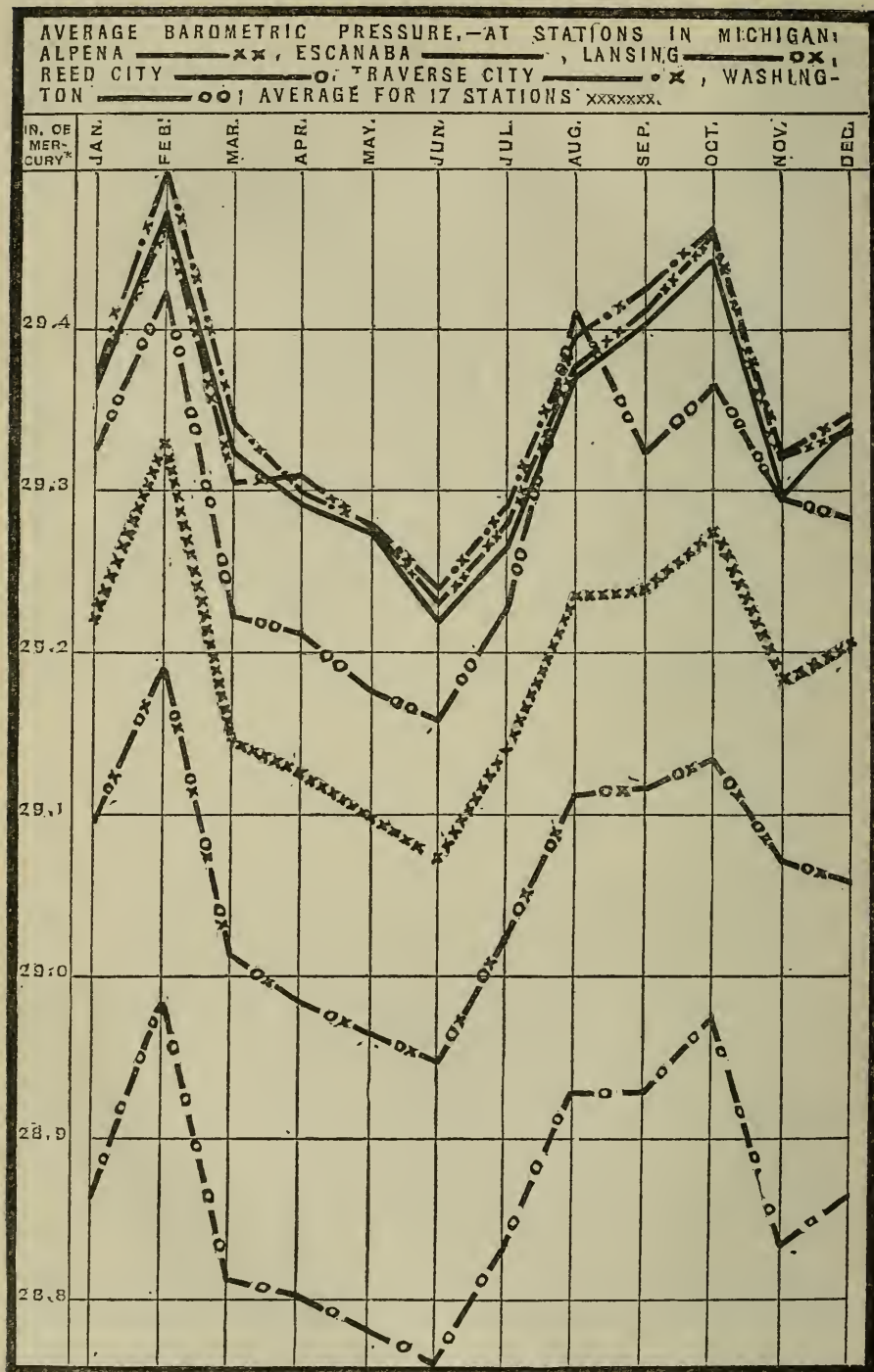
\* The observations were made at 7 A. M., 2 P. M., and 9 P. M., local time, except at the U. S. Signal Service Stations, Marquette, Escanaba, and Grand Haven, at which stations the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The local time corresponding to these hours is stated in a foot-note to Table IV., page 151.

† The average atmospheric pressure at each of these stations, by months in 1883, is given in Table XVII, page 195. ‡ Not including Hillsdale.

§ See foot-notes on latitude and elevation of some of these stations in Exhibit 9, page 131.

¶ Represents the difference between the highest of 17 stations and lowest of 17 stations for year and for each month of year. ¶ Represents sum of ranges at each station divided by 17.

DIAGRAM XV.—ATMOSPHERIC PRESSURE. BY MONTHS. IN 1883.



SCALE ONE TENTH INCH OF MERCURY TO .86 IN. VERTICALLY.  
 H. B. L., DEL.  
 DES. BY H. B. L.

TABLE XVII.—Average Atmospheric Pressure for the Year, and for each Month in the Year 1883, at 19 Stations in Michigan, as indicated by the Height, in inches, of Mercury in the Barometer. Corrected for Temperature,—Reduced to 32° F., (for some Stations not corrected for Instrumental Errors\*).—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,† by Observers‡ for the State Board of Health and for the U. S. Signal Service.

STATIONS IN MICHIGAN.† (Those of U. S. Signal Service in Italics.)		INCHES OF MERCURY.—ATMOSPHERIC PRESSURE.															
Divi- sion of the State.‡	Av. for 17 Stations ¶.	MONTHS, 1883.												Sept.	Oct.	Nov.	Dec.
		YEARS.															
		Norm.§	1883.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.					
-----	-----	29.189	29.221	29.328	29.145	29.125	29.069	29.072	29.140	29.293	29.238	29.275	29.182	29.205			
-----	29.267	29.268	29.375	29.250	29.220	29.215	29.157	29.201	29.304	29.345	29.378	29.216	29.274				
U. P.	<i>Marquette*</i>	29.341 2	29.362	29.472	29.522	29.290	29.272	29.217	29.265	29.404	29.443	29.296	29.341				
N. W.	<i>Traverse City</i>	29.360 2	29.371	29.495	29.342	29.299	29.279	29.238	29.289	29.395	29.432	29.321	29.367				
N. E.	<i>Apex*</i>	29.353 1	29.366	29.465	29.303	29.308	29.276	29.230	29.280	29.377	29.410	29.319	29.366				
W.	<i>Grand Haven*</i>	29.342 1	29.350	29.500	29.328	29.273	29.259	29.236	29.280	29.384	29.418	29.340	29.383				
W.	<i>Reed City</i>	28.916 5	28.863	28.684	28.813	28.801	28.781	28.756	28.831	28.929	28.920	28.843	28.891				
B. & E.	<i>Port Austin</i>	29.330 2	29.380	29.498	29.341	29.312	29.286	29.222	29.311	29.419	29.432	29.333	29.376				
B. & E.	<i>Port Huron*</i>	29.333 5	29.401	29.492	29.286	29.275	29.243	29.196	29.240	29.340	29.359	29.298	29.313				
B. & E.	<i>Thornville</i>	28.971 4	29.060	29.167	28.965	28.900	28.893	28.883	28.920	29.015	29.046	28.969	28.954				
O.	<i>Agricultural College*</i>	29.100 2	29.116	29.229	29.043	29.029	28.994	28.985	29.029	29.114	29.117	29.115	29.111				
S. O.	<i>Lansing</i>	29.055 3	29.066	29.189	29.013	28.985	28.965	28.947	29.023	29.114	29.117	29.134	29.058				
S. O.	<i>Ann Arbor</i>	28.825 2	28.857	29.191	28.986	28.976	28.965	28.947	29.019	29.092	29.096	29.126	29.043				
S. O.	<i>Hillsdale</i>	29.012 1	28.854	29.134	28.762	28.742	28.727	28.721	28.803	28.871	28.863	28.844	28.810				
S. O.	<i>Kalamazoo*</i>	29.031 7	29.024	29.198	28.935	28.911	28.893	28.864	28.942	29.025	29.037	29.071	29.052				
S. O.	<i>Marshall</i>	29.111 3	29.080	29.198	28.990	28.968	28.938	28.938	29.026	29.099	29.096	29.174	29.174				
S. O.	<i>Mendon</i>	29.145 2	29.202	29.296	29.103	29.074	29.048	29.012	29.099	29.170	29.161	29.253	29.125				
S. O.	<i>Deerfield</i>	29.321 1	29.192	29.291	29.086	29.069	29.040	29.046	29.097	29.175	29.181	29.270	29.178				
S. E.	<i>Deerfield</i>	29.405	29.405	29.482	29.277	29.253	29.226	29.210	29.281	29.363	29.370	29.404	29.354				
S. E.	<i>Washington</i>	29.285	29.335	29.423	29.221	29.211	29.177	29.158	29.225	29.412	29.322	29.361	29.283				

\* For stations marked thus \* a correction has been made for instrumental error, as follows: For Marquette .004 added; for Escanaba .012 added; for Alpena .006 added; for Grand Haven .002 added; for Port Huron .001 subtracted; for Detroit .017 added; for Agri College .013 subtracted; for Kalamazoo .15 subtracted. For other stations the instrumental error of barometer is not known.

† At stations of the U. S. Signal Service for the year 1883 the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of these stations is stated in the star (\*) foot-note to Table IV, page 151.

‡ The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 8, page 130. The full names of divisions, and the counties in each division, are stated in Exhibit 1, page 59.

§ Numbers in this column state the average annual atmospheric pressure for a period of years ending in each case with Dec. 31, 1883. The small figures at the right of numbers which state the average, denote the number of years included in the average.

¶ This line is an average for only 17 stations. It does not include Thornville and Kalamazoo. Green's standard barometer was used at all these 19 stations except Kalamazoo, Port Huron, and Thornville first 3 months of 1883, during which time an aneroid barometer was used. The barometer at Kalamazoo was manufactured by J. Foster, Cincinnati, Ohio.

a For 30 days. b For 20 days. c For 25 days. d For 27 days. e For 23 days. f For 24 days. g For 21 days. h For 18 days. i For 17 days. j For 16 days.

NOTE.—Daily and monthly averages for the year 1883 were furnished by the observers at Marquette, Escanaba, Alpena, Grand Haven, Port Huron, and Ann Arbor. Daily averages only, by observer at Detroit. The remainder of the computations were made at the office of the State Board of Health. The lines for 6 stations in this Table are graphically represented in Diagram XV, page 194.



# THE TIME OF GREATEST PREVALENCE OF EACH DISEASE.

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## Contributions to the Study of THE CAUSES OF DISEASES.

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**A Statistical Report based on Weekly Reports of Diseases in Michigan during the Year 1883, and preceding years.**

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BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

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This paper continues a subject begun in the report of the State Board of Health for the year 1876, and continued in each subsequent report under the title, "Weekly Reports of Diseases." It presents a summary for the year 1883 of the weekly reports of diseases received by the Board from health officers of cities and villages, and from regular correspondents of the Board. It includes a series of graphic illustrations which show the rise and fall of sickness from several diseases, that is to say, the times of greatest and of least danger from each disease; also a series of exhibits showing the relations between the diseases causing most sickness in Michigan, and certain meteorological conditions co-existing in 1883, and statements in the form of propositions calling attention to a method of learning certain laws that seem to grow out of these relations.

The names and addresses of observers whose reports for 1883 have been compiled, are printed in Exhibit 42, page 218.

Weekly reports are now regularly received concerning twenty-seven diseases, the names of which are printed on the blank, and concerning which positive report is made every week whether a case is observed or not. Inflammation of kidney was first printed on the blanks sent out in July, 1883, and is not included in the tables in this paper, because it seems that diseases not printed on the card are not as fully reported as are those to which attention is thus especially called.

Without a greater number of reports than are now received it is not possible to make accurate comparative estimates of sickness in different localities; but the reports now received are sufficient in number to make very satisfactory data for the State as a whole, because of the great probability that one hundred observers in active general practice in as many different parts of the State will, on the average, see an average of the diseases which prevail throughout the State. The compiling of these reports is a work of some magnitude, and it is a question whether this office wants to undertake, just at the present time, the labor of compiling a sufficient number of reports to render it possible to study the relations of sickness to localities, considering that in order to do this successfully it will be necessary to study not only the comparative sickness but also the comparative conditions likely to affect the sickness in each locality. Later, it will be very desirable to do this, but for the present a very important work is being done in learning the time of greatest prevalence of each disease, and, consequently, the time of greatest danger from each disease in the State considered as a unit. This is a sufficiently diffi-

cult undertaking, which is not yet being accomplished in any other State or country so successfully as it is done in Michigan, for it can be truthfully claimed that the time of year of greatest danger from most of the important diseases has been learned for this State; and not only this, but the meteorological and other conditions which are coincident with those times of greatest danger have also been learned for several of the diseases which cause most sickness in Michigan. This gives a clue to the methods which must be adopted for the prevention of each of those diseases, and it would seem to be of vastly greater consequence than a knowledge of those finer distinctions which relate to the differences between different portions of the State. It is, for instance, of greater consequence to the safety of the people that they know that, throughout the State, wherever the water-supply is from wells liable to be contaminated by the discharges from persons suffering from typhoid fever, there is greatest danger of sickness from typhoid fever when the water in the wells is low. This fact seems now to have been established. It is of more use to know this, and to act upon it by securing greater purity of the water, or by boiling it before it is drank, than it would be to know that in certain parts of the State the people are comparatively exempt from typhoid fever, because it may not be practicable for all to move to the favored locality, and because by knowing the cause of the fever, the disease may be to a great extent avoided even in localities where it has been most fatal.

Typhoid fever is not the only disease concerning which important facts have been learned by means of these weekly reports of sickness in Michigan; but it is a disease which has caused great mortality in Michigan, as in other States, and a disease the measures for preventing which have been made much more clear by the evidence which has been collected in this State.

For the purpose of learning the causes of diseases, by means of a compilation of facts, it is just as important to know when, where, and under what conditions there is no sickness, or but little sickness, from any disease, as to know when there is much sickness from that disease. It is therefore earnestly requested that every observer will carefully note and report on the postal blanks the facts concerning each disease, whether there be much sickness, little sickness, or no sickness from the disease. General statements concerning the amount of sickness, though useful, cannot supersede definite statements concerning each disease such as is provided for on the blank report-card. The omission of a report for a single week increases the work, and impairs the value of the compilation. For these reasons, it is very desirable that all observers should be as regular and prompt as possible in sending in their reports.

Great credit is due the busy practitioners who forward these weekly reports. The service is, as a rule, without compensation. No other class of persons, however, has so great a knowledge of the facts that are necessary in the compilation of health statistics; and it is greatly to the credit of physicians that they are so willing and ready to coöperate in every effort made for the advancement of the public health.

#### PLAN OF THE REPORTS.

The method of securing, and the plan of making these reports, may be thus stated:—

The blanks for the weekly reports are printed on postal cards, which are supplied to the observers of diseases. Blank record-books, in which to preserve copies of the reports, remarks, etc., are

also supplied to these observers, to be retained by them. The reports are forwarded weekly to the Secretary of the State Board of Health, at Lansing.

The plan of making the report is as follows: Each observer is requested to mark the disease of which there was the greatest number of cases under his observation during the week for which the report is made, 1; that of which there was the next greatest number of cases, 2; the next, 3, and so on, applying consecutive numbers to the diseases reported present; but marking with the same figure all diseases of which there is the same number of cases; to write 0 opposite each disease mentioned of which there was no case; to apply these numbers without regard to the severity of the cases; to include all cases, without regard to when they were taken sick, so long as they are actually sick with the given disease; to include all cases within the knowledge—"under the observation"—of the observer, without regard to who may have charge of them. It has not seemed best to ask for an exact statement of the number of cases, though a blank is left for that purpose on the card, for the convenience of those observers who prefer to state the number of cases rather than the order of prevalence by the foregoing method.

To illustrate the method of making the reports, the following copy of one of the blanks now in use is given, correctly marked, in the "prevalence" column, for the number of cases stated on the right-hand margin. It should be remembered that the numbers in the "prevalence" column denote simply the relative order in which the several diseases appear to be prevalent, and do not denote a definite number of cases; so that a disease might one week be marked 4, and the following week, with the same number of cases, be marked 1. Names of diseases, and figures printed in italics are not printed on the postal blanks, but are supposed to have been written on the report by the observer.

Diseases in.....[and vicinity?],  
[PLEASE DATE.]  
week ending Sat.,....., 188.....

No. ....	Prevalence. Order. See a.	Cases.
ED. 23.		
Brain, Inflammation of....	14	1
Bowels, Inflammation of....	12	3
Bronchitis.....	11	4
Cerebro-spinal Meningitis.....	0	0
Cholera Infantum.....	8	9
Cholera Morbus.....	10	6
Consumption, Pulmonary..	10	6
Croup, Membranous.....	12	3
Diphtheria.....	5	14
Diarrhea.....	3	17
Dysentery.....	8	9
Erysipelas.....	13	2
Fever, Intermittent.....	2	21
Fever, Remittent.....	11	4
Fever, Typhoid (Enteric)...	0	0
Fever, Typho-malarial.....	9	7
Influenza.....	7	11
Kidney, Inflammation of....	14	1
Measles.....	1	27
Neuralgia.....	14	1
Pneumonia.....	9	7
Puerperal Fever.....	0	0
Rheumatism.....	6	12
Scarlatina.....	4	16
Small-pox.....	0	0
Tonsillitis.....	11	4
Whooping-cough.....	0	0
Mumps.....	6	12
Dyspepsia.....	11	4

a. Please mark the disease of which there is the greatest number of cases, 1; the disease having next greatest number of cases, 2; the next, 3; and so on for each disease, writing the same figures opposite diseases having the same number of cases. Write 0 opposite each disease of which there is no case under your observation. [For full statement of plan, see second, third, and fourth pages of record-book cover.] A blank indicates that the item has been overlooked.  
Please mail this, ED, signed and dated, ~~23~~ 21 at noon as convenient after close of week specified.

This report is of disease under your observation; if it includes a contagious disease, please mention, on the bottom or margin of this card, the township, city, or village in which the disease is.

M.D.



## COMPILATION OF THE REPORTS.

The method of compiling the reports is set forth in connection with tables on the following pages; it is somewhat more fully explained on pages 306, 307, and 310 of the Report for 1881. Table 3, giving statements by months for each locality from which reports were received for 1883 has been prepared, but, to avoid making a bulky volume, it is not printed in this Report. The manuscript is preserved for reference and future study.

One of the best indications afforded by the weekly reports, as to the relative prevalence of the several diseases is to be found by noting what per cent of the reports received for a given time stated the presence of each disease. This per cent has been computed for each disease by months and for the year 1883. It is thus stated in Exhibit 40, page 201, which also states the per cent for each disease for each of the preceding six years. What per cent of reports stated the presence of each disease by months in 1883 is also graphically represented in Diagrams 1-5, on page 200, and following pages.

For several diseases a comparison has been attempted of the amount of sickness in 1883 (as indicated by the proportion of reports stating presence of the disease) with the average amount for a period of seven years. These comparisons are stated in Exhibits 47, 49, 54, and 56. This comparison may also be facilitated by reference to Table 1, pages 203-5, in which is stated for each of the years 1877-83, and by months in each of those years, by what per cent of the observers reporting for the given month (or for an average month of the year) the several diseases were reported.

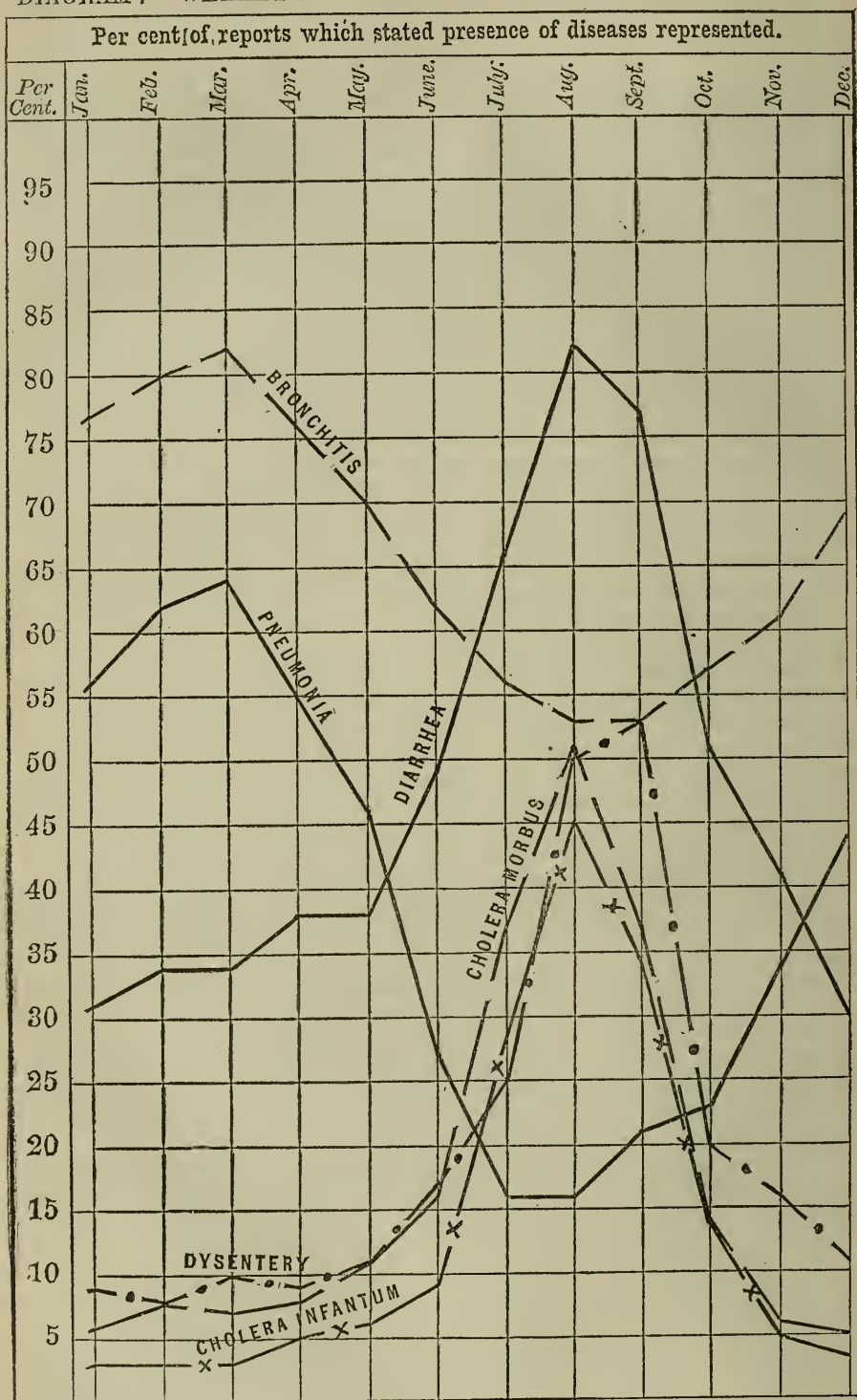
A study of the reported sickness from 18 of the diseases, in connection with meteorological conditions, by months in 1883, is made in Exhibit 46 and following exhibits. By arranging months in order of greatest prevalence of the disease under consideration, noting whether it was more or less prevalent than the average for the year, and noting what were the meteorological conditions for the same months as compared with the average for the year, relations and conditions are grouped for convenient comparison. A summary of one line of the evidence of these exhibits is given in Exhibits 60 and 61.

In Exhibits 43 and 44, on following pages 220 and 221, the leading diseases are arranged in order according to greatest amount of sickness reported from them in 1883, as thus affording an indication as to what diseases cause most sickness.

It will be noticed that for the State, intermittent fever heads the list, as in former years. By comparing 1883 with preceding years, in this exhibit and similar exhibits in former reports, it will be noticed that there has been a gradual decrease in the per cent of reports stating the presence of remittent fever since 1878. Several of the diseases represented in Exhibit 43, were reported on nearly the same per cent of reports in 1883 as in 1882; the average for 26 diseases is the same in 1883 as in 1882.

The comparison with former years is facilitated by reference to Exhibit 40, page 201, Table 1, pages 203-5, and Exhibits 47, 49, 54, and 56, on following pages.

DIAGRAM I — WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1883.



Designed by Henry B. Baker.

EXHIBIT 40.—*Stating for each of 26 Diseases for the six Years ending Saturday, December 29, 1883, for each of those Years, and by Months of the Year 1883, on what Per Cent of the Reports Received the Disease was stated to be Present.—Compiled from Weekly Reports by Health Officers of Cities and Villages, and by Regular Correspondents of the State Board of Health.\**

DISEASES,	WHAT PER CENT OF REPORTS RECEIVED STATED PRESENCE OF THE DISEASE.																					
	Av., 1877-83.	YEARS.							MONTHS, 1883.													
		1877.	1878.	1879.	1880.	1881.	1882.	1883.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		
Average.....†	31	28	30	33	32	33	30	30	30	31	33	33	31	29	29	32	32	29	29	28		
Brain, Infl. of.....‡	---	---	---	---	6	5	5	6	2	5	6	7	6	6	6	6	5	6	8			
Bowels, Infl. of. ‡	---	---	---	---	12	14	13	16	13	13	12	17	16	16	16	25	18	15	17	14		
Bronchitis.....	63	55	64	64	64	62	65	66	77	80	82	76	70	62	56	53	53	57	61	69		
Cerebro-sp. Men..	4	3	2	2	2	9	6	5	2	5	6	7	6	6	7	4	7	4	4	3		
Cholera Infant....	13	11	11	14	14	18	12	14	3	3	3	5	6	9	28	45	34	14	5	3		
Cholera Morbus..	18	15	14	19	20	26	17	18	6	8	7	8	11	16	37	51	37	14	6	5		
Consumption, P.‡	66	52	71	70	68	71	66	61	69	66	66	65	62	61	59	55	57	58	58	60		
Croup, Membran.	7	6	7	7	6	9	7	6	9	10	6	7	6	5	3	4	5	5	7	7		
Diphtheria.....	25	19	23	29	27	34	25	17	26	21	19	16	15	14	15	12	12	15	22	15		
Diarrhea.....	47	41	41	48	47	52	48	49	31	34	34	28	38	49	66	82	77	51	41	30		
Dysentery.....	20	21	19	18	18	23	17	21	9	8	10	9	11	17	25	50	53	20	16	11		
Erysipelas.....	23	20	21	25	25	23	22	25	29	34	30	31	27	27	20	19	19	24	24	22		
Fever, Intermitt. .	78	75	82	82	82	82	71	69	56	62	63	68	74	73	78	77	76	71	62	60		
Fever, Remitt. ....‡	52	52	58	57	56	54	48	41	36	32	36	41	42	46	43	43	52	45	39	32		
Fever, Typhoid..	13	14	10	12	14	18	14	11	11	7	7	7	6	7	6	11	19	21	17	14		
Fev., Typho-m...‡	24	26	24	22	24	29	24	18	17	15	13	12	15	14	11	21	32	29	24	15		
Influenza.....	41	41	44	45	42	35	40	43	51	62	71	60	50	33	24	21	26	35	39	47		
Measles.....	15	7	5	12	19	26	11	24	18	20	28	45	51	42	26	12	9	10	11	12		
Neuralgia.....‡	---	---	---	59	64	65	68	69	77	75	75	78	73	68	64	59	62	64	65	68		
Pneumonia.....	40	40	41	41	42	41	39	38	56	62	64	55	46	27	16	16	21	23	34	44		
Puerperal Fever.	5	4	3	3	3	5	7	7	7	5	7	7	7	6	6	8	6	5	5	9		
Rheumatism.....	68	60	68	72	71	71	68	63	77	71	70	80	77	69	64	57	55	62	69	70		
Scarlatina.....	20	21	25	23	15	19	18	19	22	21	24	23	22	18	17	13	16	17	22	17		
Small-pox.....	1	4	0.2	0.4	0.4	2	3	0.3	2	1	0	0	0.2	1	0.3	0	0	0	0	0		
Tonsilitis.....‡	---	---	---	45	49	48	48	50	64	61	61	58	54	41	36	35	43	48	55	54		
Whooping-cough.	21	21	21	23	32	16	17	15	14	14	14	16	17	13	12	14	14	14	17	19		
Number of re- ports received }	3865	3320	3221	3755	3991	3567	4745	4458	444	357	345	332	417	343	371	475	361	422	298	293		

Statements in this exhibit for months in 1883 are graphically represented in Diagrams 1, 2, 3, 4, 5, opposite this page and on following pages.

\* For 1883 the names of observers are stated in Exhibit 42, page 218.

† This line is an average for such of the tabulated diseases as were reported present in the given month or year.

‡ See foot-note with this mark in Table I., pages 203, 204, and 205.



EXHIBIT 41.—*Stating, by Months of the Year ending Saturday, December 29, 1883, for the State, and for each of the Eleven Geographical Divisions of Michigan from which Weekly Reports of Diseases were received, the Number of Observers from whom the Reports were received, the Number of Reports received; the day on which, for the purposes of this compilation, each month is made to end; and the Number of Weeks thus included in each Month.*

MONTHS, 1883.	MONTHS AND YEAR END SATURDAY.	STATE.		DIVISIONS OF THE STATE.*																						
		Observers.†	Reports.†	1. UPPER-PEN- INSULAR.*		2. NORTH- WESTERN.*		3. NORTH- EASTERN.*		4. NORTH- EASTERN,*		5. WESTERN*		6. NORTHERN CENTRAL.*		7. DAY AND EASTERN.*		8. CENTRAL		9. SOUTH- WESTERN*		10. SOUTHERN- CENTRAL.*		11. SOUTH- EASTERN.*		
		Number of weeks.	Observers.†	Reports.†	Observers.†	Reports.†	Observers.†	Reports.†	Observers.†	Reports.†	Observers.†	Reports.†	Observers.†	Reports.†	Observers.†	Reports.†	Observers.†	Reports.†	Observers.†	Reports.†	Observers.†	Reports.†	Observers.†	Reports.†	Observers.†	Reports.†
Year, 1883.	Dec. 29, 1883.	52	140	4,458	8	254	3	125	3	69	2	85	19	510	6	108	13	429	34	1,054	12	342	30	970	10	452
Av. per month.		--	83	372	5	21	2	10	1	6	2	7	10	43	3	14	8	36	21	88	7	29	19	81	9	38
January	Feb. 3.	5	99	414	7	34	2	10	1	5	1	5	9	42	3	15	13	65	16	79	7	34	23	115	8	40
February	March 3.	4	90	357	6	22	2	8	1	4	1	4	9	36	3	12	12	48	18	71	7	28	23	92	8	32
March	March 31.	4	87	345	5	19	2	8	1	4	1	4	8	32	3	12	12	47	19	75	6	24	22	88	8	32
April	April 28.	4	85	332	4	15	2	8	1	4	1	4	10	39	3	11	11	43	18	72	7	26	20	78	8	32
May	June 2.	5	87	417	4	18	3	15	1	5	2	9	11	50	4	19	8	40	21	100	6	28	17	85	10	48
June	June 30.	4	88	343	4	16	3	12	2	8	2	8	10	35	4	16	7	28	22	87	7	26	17	68	10	39
July	July 28.	4	95	371	5	20	3	12	2	8	2	8	13	51	3	12	7	26	25	97	8	30	18	71	9	36
August	Sept. 1.	5	98	475	5	25	3	15	3	14	2	9	14	67	4	17	6	30	23	112	8	38	21	103	9	45
September	Sept. 29.	4	92	361	5	20	3	12	1	4	2	8	13	51	4	15	6	24	22	87	8	31	19	73	9	36
October	Nov. 3.	5	88	422	5	25	2	10	1	5	2	10	12	52	4	19	7	35	22	109	7	33	17	81	9	43
November	Dec. 1.	4	77	298	5	20	2	8	1	4	2	8	7	25	3	12	6	23	21	82	5	20	16	62	9	34
December	Dec. 29.	4	75	293	5	26	2	7	1	4	2	8	8	30	2	8	5	20	21	83	6	24	14	54	9	35

\* For counties in each division, see Exhibit 1, page 53.

† From some of the observers reports were not received for every week so that the number of reports received does not equal the number of observers multiplied by the number of weeks in the given month, or in the year.

‡ In some localities there were more observers than one. The whole number of localities from which reports were received was 113; the average number per month was 81. The names of observers and number of cards received from each observer for each month and for the year is stated in Exhibit 42, page 218.

TABLE 1.—*Stating, by Months, in each of the Five Years ending Saturday, December 29, 1883, also by a Monthly Average for each of those Years and for the entire period, by what Per Cent of Observers each of 26 Diseases was Reported Present (also the Number of Observers Reporting for the Month).—Compiled from Weekly Reports by Health Officers of Cities and Villages and from Regular Correspondents of the State Board of Health.\*—Diseases arranged by Year and Months in order of Greatest Number of Observers reporting them present in 1883.—(Continued on pages 204, 205).*

LINE NUMBER.	DISEASES.	OBSERVERS BY WHOM THE SEVERAL DISEASES WERE REPORTED PRESENT.—AVERAGE PER CENTS† (PER MONTH) OF THOSE MAKING REPORTS.							
		Average 1877-83.	1883.	1882.	1881.	1880.	1879.	1878.	1877.
	Av'ge for Tabulated Diseases Reported Present. }	42	43	43	45	43	44	39	38
1	Neuralgia†.....		85	85	78	79	75		
2	Rheumatism.....	83	83	85	84	85	85	81	78
3	Intermittent Fever.....	87	82	83	90	90	90	90	85
4	Bronchitis.....	76	79	80	74	77	75	75	71
5	Tonsilitis†.....		73	72	65	67	63		
6	Consumption, Pulmonary†.....	73	71	74	78	76	78	76	61
7	Diarrhea.....	64	67	69	67	63	65	57	53
8	Pneumonia.....	59	59	61	60	62	60	58	56
9	Remittent Fever†.....	66	57	64	66	67	69	71	68
10	Influenza.....	54	56	55	48	54	57	57	54
11	Erysipelas.....	41	47	42	42	45	43	35	35
12	Measles.....	23	37	20	37	30	18	7	12
13	Dysentery.....	32	35	31	34	30	31	30	34
14	Typho-malarial Fever†.....	36	32	39	43	37	32	35	37
15	Cholera Morbus.....	32	32	31	41	34	34	25	26
16	Scarlatina.....	33	32	32	32	26	36	38	33
17	Diphtheria.....	40	31	43	51	43	45	37	32
18	Inflammation of Bowels†.....		31	28	26	25			
19	Cholera Infantum.....	22	24	22	27	23	23	29	17
20	Whooping-cough.....	29	23	26	24	42	31	23	28
21	Typhoid Fever (enteric).....	21	19	24	26	21	18	16	22
22	Puerperal Fever.....	11	15	18	12	8	8	6	10
23	Membranous Croup.....	15	14	15	19	13	16	14	14
24	Inflammation of Brain†.....		12	12	12	13			
25	Cerebro-spinal Meningitis.....	9	11	12	16	6	5	6	6
26	Small-pox.....	3	1	5	4	1	1	1	5
	Number of observers.....		140	159	116	112	110	97	115
	Av. No. of Observers per Month. }	76	*88	93	70	79	73	64	66

\* For 1883 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit 41, page 202; the names of the observers and the number of the reports received from each are stated in Exhibit 42, page 218.

† The numbers opposite the names of the diseases do not state what per cent of the whole number of observers for the year reported the disease present at some time during the year, but state (on an average for the twelve months of the year) by what per cent of the observers making reports for the several months, the disease was reported present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the observers for that month (the number of whom is stated at the foot of the column) reported the given disease in that month.

‡ Consumption, remittent fever, and typho-malarial fever were not printed on the first blanks used in making weekly reports (beginning with the month of September, 1876); neuralgia and tonsilitis were not printed on any blanks used prior to October, 1878, and not on all used for several months after that date; inflammation of brain and inflammation of bowels were not printed on any blanks used prior to July, 1879, and not on all used for several months after that date; hence it is probable that these diseases were not so fully reported at first as were the other diseases.

TABLE 1.—CONTINUED.—*Per Cent of Observers by which the several*

PER CENT OF OBSERVERS BY WHICH DISEASES WERE REPORTED PRESENT.																		
		JANUARY.*					FEBRUARY.*					MARCH.*						
LINE NUMBER.	DISEASES.	AV. 177-83.	1882.	1881.	1880.	1879.	DISEASES.	AV. 177-83.	1882.	1881.	1880.	1879.	DISEASES.	AV. 177-83.	1882.	1881.	1880.	1879.
	Av. Disease...	43	44	43	44	42	Av. Disease...	42	42	44	42	44	Av. Disease...	42	44	44	44	46
1	Neuralgia...	96	86	81	84	67	Neuralgia...	91	82	83	82	75	Bronchitis...	88	91	85	90	92
2	Rheumatism...	80	96	86	83	95	Bronchitis...	80	90	83	92	94	Neuralgia...	82	91	87	90	91
3	Bronchitis...	83	87	86	90	88	Rheumatism...	86	84	82	86	92	Pneumonia...	73	83	84	78	91
4	Tonsillitis...	87	81	81	73	77	Tonsillitis...	82	76	76	78	80	Influenza...	73	82	66	70	75
5	Consumption...	75	80	73	79	73	Consumption...	76	80	75	84	77	Tonsillitis...	82	86	76	82	79
6	Pneumonia...	82	80	76	86	82	Pneumonia...	78	78	81	86	89	Rheumatism...	86	80	89	93	87
7	Int. Fever...	78	76	75	80	81	Int. Fever...	78	77	78	79	80	Int. Fever...	81	76	84	85	84
8	Influenza...	71	66	65	67	75	Influenza...	73	74	71	78	88	Consumption...	76	75	74	84	75
9	Remit. Fever...	58	57	61	56	53	Erysipelas...	44	53	38	49	43	Remit. Fever...	57	54	51	67	60
10	Diarrhea...	46	54	58	44	36	Diarrhea...	42	52	46	51	39	Diarrhea...	47	49	59	55	46
11	Erysipelas...	48	54	45	49	46	Remit. Fever...	54	47	55	56	54	Erysipelas...	46	47	44	53	51
12	Diphtheria...	50	43	56	56	41	Diphtheria...	46	39	49	60	45	Measles...	29	43	29	55	41
13	Scarlatina...	41	40	34	40	34	Scarlatina...	40	33	39	44	31	Scarlatina...	43	40	41	48	34
14	Measles...	19	33	18	27	24	Measles...	22	32	19	44	30	Diphtheria...	42	34	45	51	49
15	Typho-mal. F.†	32	32	46	30	39	Inf. of Bowels†	—	29	26	27	16	Inf. of Bowels†	—	24	32	28	29
16	Inf. of Bowels†	—	30	26	19	29	Typho-mal. F.†	26	26	29	27	29	Typho-mal. F.†	24	21	31	22	26
17	Dysentery...	15	24	14	11	16	Whoop-cough...	23	23	25	23	40	Dysentery...	15	21	21	22	13
18	Whoop-cough...	20	22	27	30	39	Mem. Croup...	21	19	19	33	17	Whoop-cough...	27	20	29	22	45
19	Typhoid Fever...	20	21	25	20	18	Cholera Morb.	12	16	13	17	7	Mem. Croup...	19	16	21	25	14
20	Mem. Croup...	26	21	20	30	28	Dysentery...	12	14	14	7	14	Cholera Morb.	13	16	16	16	10
21	Cholera Morb.	10	18	12	11	10	Puerperal Fev.	11	13	22	13	6	Puerperal Fev.	14	16	17	16	8
22	Puerperal Fev.	13	16	13	11	8	Cer.-spi. Men.	8	11	15	7	2	Cer.-spi. Men.	10	13	16	13	7
23	Cholera Infan.	4	9	4	0	5	Inf. of Brain...	—	11	14	10	17	Typhoid Fever...	12	10	17	13	15
24	Inf. of Brain...	7	9	9	13	—	Typhoid Fev.	16	9	27	16	22	Inf. of Brain...	—	10	11	16	13
25	Cer.-Spi. Men.	6	3	13	10	2	Cholera Infan.	4	8	4	4	1	Cholera Infan.	—	5	7	5	4
26	Small-Pox...	4	2	9	3	1	Small-pox...	3	2	9	1	0	Small-pox...	2	0	6	1	0
	Observers...	78	90	97	70	83	Observers...	79	90	100	70	87	Observers...	77	87	98	67	85
		APRIL.*					MAY.*					JUNE.*						
LINE NUMBER.	DISEASES.	AV. 177-83.	1882.	1881.	1880.	1879.	DISEASES.	AV. 177-83.	1882.	1881.	1880.	1879.	DISEASES.	AV. 177-83.	1882.	1881.	1880.	1879.
	Av. Disease...	42	45	42	47	41	Av. Disease...	41	45	43	44	40	Av. Disease...	40	41	41	45	46
1	Neuralgia...	93	90	84	82	78	Bronchitis...	79	89	86	80	74	Int. Fever...	93	89	86	96	96
2	Rheumatism...	87	93	85	83	93	Rheumatism...	85	89	84	89	83	Neuralgia...	85	85	83	78	81
3	Bronchitis...	84	85	80	88	80	Neuralgia...	86	91	81	75	69	Rheumatism...	84	85	87	86	89
4	Tonsillitis...	81	71	75	70	78	Int. Fever...	92	85	87	94	93	Bronchitis...	69	75	77	72	77
5	Int. Fever...	79	79	81	91	90	Tonsillitis...	78	78	72	65	65	Cholera Morb.	65	69	61	80	73
6	Pneumonia...	78	75	81	79	86	Consumption...	73	77	79	79	78	Consumption...	71	69	74	72	73
7	Influenza...	65	73	60	66	57	Pneumonia...	70	76	73	83	65	Measles...	38	60	63	62	61
8	Consumption...	76	71	78	79	78	Measles...	43	71	37	80	49	Tonsillitis...	60	69	64	64	64
9	Measles...	38	56	22	81	54	Influenza...	55	64	55	49	46	Remit. Fever...	67	59	65	77	74
10	Remit. Fev.†	61	55	64	62	61	Diarrhea...	55	63	62	54	57	Erysipelas...	41	50	41	42	49
11	Diarrhea...	48	53	65	54	41	Remit. Fever...	66	56	65	67	69	Influenza...	41	48	53	30	34
12	Erysipelas...	46	51	45	44	52	Erysipelas...	48	54	49	40	58	Pneumonia...	48	43	57	54	47
13	Scarlatina...	38	35	36	46	31	Scarlatina...	33	36	35	37	23	Dysentery...	27	32	16	36	35
14	Diphtheria...	40	32	43	49	43	Typho-mal. F.†	21	31	23	24	14	Cholera Morb.	39	31	28	64	57
15	Inf. of Bowels†	—	32	24	16	20	Inf. of Bowels†	—	31	21	20	28	Inf. of Bowels†	—	31	21	30	28
16	Whoop-cough...	26	24	21	22	45	Whoop-cough...	31	30	25	26	51	Diphtheria...	31	28	33	32	35
17	Typho-mal. F.†	21	22	28	18	14	Diphtheria...	32	28	33	43	38	Scarlatina...	31	28	34	30	30
18	Mem. Croup...	16	19	14	13	22	Cholera Morb.	20	24	16	29	16	Typho-mal. F.†	25	26	21	19	20
19	Cholera Morb.	14	16	17	22	8	Dysentery...	17	24	16	11	12	Whoop-cough...	29	19	26	28	51
20	Dysentery...	14	16	26	7	11	Puerperal Fev.	12	20	21	13	6	Cholera Infan.	24	18	22	39	25
21	Inf. of Brain...	—	15	15	15	12	Mem. Croup...	11	16	13	11	7	Typhoid Fever...	12	17	16	12	8
22	Cer.-spi. Men.	12	14	15	34	5	Typhoid Fev.	10	13	13	9	7	Mem. Croup...	9	14	7	13	8
23	Puerperal Fev.	8	13	9	9	7	Cholera Infan.	7	13	6	10	5	Puerperal Fev.	12	13	25	12	4
24	Typhoid Fever	11	12	15	7	8	Inf. of Brain...	—	13	16	13	15	Inf. of Brain...	—	11	16	7	12
25	Cholera Infan.	4	9	2	0	1	Cer.-spi. Men.	11	11	14	26	7	Cer.-spi. Men.	10	10	14	20	4
26	Small-pox...	3	0	6	9	1	Small-pox...	4	1	11	7	1	Small-pox...	3	1	6	0	4
	Observers...	73	85	86	68	83	Observers...	75	87	95	70	81	Observers...	74	88	87	69	74

\* For 1883 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit 41, page 202; the names of observers and the number of the reports received from each are stated in Exhibit 42, page 218.

† The numbers in this line are an average, not for all diseases represented, but only for those reported present in the given month.

‡ See foot-note with this mark on page 203.

§ The numbers in this line state how many observers reported for the month in the given year.



Diseases were Reported Present, by Months in each of the Years 1879-83.

PER CENT OF OBSERVERS BY WHICH DISEASES WERE REPORTED PRESENT.												
JULY.*						AUGUST.*						LINE NUMBER.
DISEASES.	AV.	1878.	1883.	1881.	1880.	DISEASES.	AV.	1878.	1883.	1881.	1880.	
Av. Disease...	43	42	41	46	47	Av. Disease...	45	48	45	48	48	
Int. Fever.....	93	87	86	97	98	Diarrhea.....	97	97	96	99	99	1
Diarrhea.....	91	87	82	97	99	Int. Fever.....	94	91	88	97	96	2
Neuralgia.....	81	84	69	70	76	Neuralgia.....	82	82	82	70	67	3
Rheumatism.....	77	80	84	80	83	Rheumatism.....	72	76	79	82	75	4
Bronchitis.....	59	73	66	53	65	Cholera Morb.....	80	74	80	100	85	5
Consumption.....	71	68	77	74	77	Dysentery.....	78	71	65	93	78	6
Tonsillitis.....	66	61	43	45	48	Bronchitis.....	55	70	65	49	56	7
Cholera Morb.....	71	60	53	87	88	Cholera Infan.....	69	64	69	85	70	8
Remit. Fever.....	71	58	67	71	4	Consumption.....	67	64	73	72	73	9
Dysentery.....	54	45	36	74	64	Tonsillitis.....	63	60	39	50	49	10
Cholera Infan.....	50	44	28	70	66	Remit. Fever.....	77	62	69	76	80	11
Measles.....	28	42	31	37	33	Erysipelas.....	34	44	41	27	35	12
Erysipelas.....	38	41	39	40	45	Inf. of Bowels.....	43	30	30	34	30	13
Influenza.....	22	35	31	19	26	Pneumonia.....	28	39	29	27	29	14
Pneumonia.....	34	29	36	36	34	Typho-mal. F.....	44	38	39	54	54	15
Scarlatina.....	26	29	24	27	16	Scarlatina.....	34	36	35	25	41	16
Inf. of Bowels.....	21	26	32	39	39	Diphtheria.....	31	30	33	43	51	17
Diphtheria.....	21	26	31	43	38	Whoop-cough.....	32	27	31	27	13	18
Typho-mal. F.....	24	22	27	37	39	Measles.....	15	23	12	28	16	19
Whoop-cough.....	32	22	31	27	48	Typhoid Fever.....	25	21	24	33	28	20
Puerperal Fev.....	10	16	19	9	9	Puerperal Fev.....	10	19	17	13	8	21
Inf. of Brain.....	7	15	5	19	10	Inf. of Brain.....	10	17	14	21	16	22
Cer. spi. Men.....	7	15	6	16	5	Mem. Croup.....	6	8	7	9	6	23
Typhoid Fever.....	4	7	13	15	21	Cer. spi. Men.....	8	7	13	12	10	24
Mem. Croup.....	4	7	6	9	3	Small-pox.....	2	0	2	1	0	25
Small-pox.....	3	1	5	4	0							26
Observers.....	76	95	88	70	89	Observers.....	79	98	101	67	80	
OCTOBER.*						NOVEMBER.*						LINE NUMBER.
DISEASES.	AV.	1878.	1883.	1881.	1880.	DISEASES.	AV.	1878.	1883.	1881.	1880.	
Av. Disease...	45	43	46	45	44	Av. Disease...	42	42	45	45	40	
Int. Fever.....	92	86	88	94	96	Neuralgia.....	78	94	81	77	78	1
Neuralgia.....	82	80	72	80	82	Rheumatism.....	84	78	88	84	84	2
Rheumatism.....	80	85	80	82	89	Int. Fever.....	87	75	85	96	89	3
Bronchitis.....	72	73	79	54	75	Bronchitis.....	80	75	85	80	75	4
Diarrhea.....	79	73	87	85	72	Tonsillitis.....	75	82	77	73	70	5
Tonsillitis.....	79	73	70	52	64	Consumption.....	75	70	72	81	75	6
Consumption.....	75	69	73	74	78	Diarrhea.....	55	58	64	56	48	7
Remit. Fever.....	76	60	74	75	74	Pneumonia.....	60	57	59	64	62	8
Erysipelas.....	39	51	44	35	41	Remit. Fever.....	67	55	67	73	61	9
Influenza.....	48	48	55	28	47	Influenza.....	57	53	53	65	49	10
Pneumonia.....	41	44	44	32	41	Erysipelas.....	38	45	39	40	44	11
Typho-mal. F.....	65	41	69	77	67	Typho-mal. F.....	50	40	57	76	39	12
Dysentery.....	45	40	48	57	50	Diphtheria.....	49	34	47	61	53	13
Typhoid Fever.....	36	36	33	52	33	Dysentery.....	22	30	30	21	15	14
Inf. of Bowels.....	35	34	25	17	17	Inf. of Bowels.....	30	31	30	17	17	15
Diphtheria.....	47	31	48	55	51	Typhoid Fever.....	32	23	41	46	31	16
Cholera Morb.....	32	31	35	45	25	Measles.....	11	22	14	6	13	17
Cholera Infan.....	26	27	34	35	16	Whoop-cough.....	29	22	26	24	29	18
Scarlatina.....	29	26	32	15	20	Inf. of Brain.....	16	11	10	9	9	19
Whoop-cough.....	28	23	23	18	32	Cholera Morb.....	14	16	16	13	8	20
Measles.....	8	18	8	8	11	Mem. Croup.....	20	16	22	24	17	21
Puerperal Fev.....	11	11	22	11	9	Puerperal Fev.....	12	13	20	13	8	22
Cer. spi. Men.....	10	11	8	17	6	Cholera Infan.....	9	12	11	13	8	23
Mem. Croup.....	14	11	21	15	14	Cer. spi. Men.....	7	10	11	14	4	24
Inf. of Brain.....	9	11	8	16	11	Small-pox.....	2	0	2	6	1	25
Small-pox.....	1	0	2	0	0							26
Observers.....	70	88	91	65	76	Observers.....	74	77	88	70	75	
DECEMBER.*						JANUARY.*						LINE NUMBER.
DISEASES.	AV.	1878.	1883.	1881.	1880.	DISEASES.	AV.	1878.	1883.	1881.	1880.	
Av. Disease...	41	39	40	42	43	Av. Disease...	41	39	40	42	43	
Rheumatism.....	86	84	90	92	88	Rheumatism.....	86	84	90	92	88	1
Neuralgia.....	79	83	81	84	80	Neuralgia.....	79	83	81	84	80	2
Bronchitis.....	84	76	82	82	83	Bronchitis.....	84	76	82	82	83	3
Int. Fever.....	79	75	71	82	83	Int. Fever.....	79	75	71	82	83	4
Tonsillitis.....	69	83	83	84	80	Tonsillitis.....	69	83	83	84	80	5
Consumption.....	74	69	70	74	76	Consumption.....	74	69	70	74	76	6
Pneumonia.....	71	65	67	65	77	Pneumonia.....	71	65	67	65	77	7
Influenza.....	62	63	58	50	59	Influenza.....	62	63	58	50	59	8
Diarrhea.....	43	48	48	45	42	Diarrhea.....	43	48	48	45	42	9
Remit. Fever.....	60	45	58	59	64	Remit. Fever.....	60	45	58	59	64	10
Erysipelas.....	40	37	40	53	52	Erysipelas.....	40	37	40	53	52	11
Measles.....	17	35	18	9	19	Measles.....	17	35	18	9	19	12
Whoop-cough.....	28	27	23	18	28	Whoop-cough.....	28	27	23	18	28	13
Typho-mal. F.....	37	27	37	60	32	Typho-mal. F.....	37	27	37	60	32	14
Scarlatina.....	35	27	32	32	37	Scarlatina.....	35	27	32	32	37	15
Diphtheria.....	48	25	46	56	57	Diphtheria.....	48	25	46	56	57	16
Inf. of Bowels.....	25	33	24	16	17	Inf. of Bowels.....	25	33	24	16	17	17
Typhoid Fever.....	26	20	24	36	25	Typhoid Fever.....	26	20	24	36	25	18
Dysentery.....	14	19	12	8	10	Dysentery.....	14	19	12	8	10	19
Puerperal Fev.....	9	17	13	16	4	Puerperal Fev.....	9	17	13	16	4	20
Cer. spi. Men.....	23	15	17	25	26	Cer. spi. Men.....	23	15	17	25	26	21
Inf. of Brain.....	13	11	8	7	7	Inf. of Brain.....	13	11	8	7	7	22
Cholera Infan.....	4	7	5	2	6	Cholera Infan.....	4	7	5	2	6	23
Cer. spi. Men.....	7	5	6	14	4	Cer. spi. Men.....	7	5	6	14	4	24
Small-pox.....	3	0	2	10	0	Small-pox.....	3	0	2	10	0	25
Observers.....	76	75	84	88	69	Observers.....	76	75	84	88	69	26

\*, †, ‡ See notes with these marks on page 203.

§ For this foot-note see page 204.

TABLE 2.—WEEKLY REPORTS OF DISEASES IN MICHIGAN IN 1883.—Exhibiting for the Year and for Each Month of the Year Ending Saturday, December 29, 1883, a Summary relative to Diseases in the State of Michigan; also for each Month a Summary relative to Diseases in each of 10 Geographical Divisions\* of the State,—Indicating the Prevalence as regards Time and Area, and also the Comparative Severity of the Diseases. Compiled from 4,458 Weekly Reports by 140 Observers, Health Officers of Cities and Villages, and Regular Correspondents of the State Board of Health.

NUMBER OF OBSERVERS, REPORTS, ETC.	DISEASES.	(A.v.) Per Cent of Observers Report- ing Presence of.	Av. Per Cent of Presence Where Present.	Per Cent of Reports of Presence of.	Average Order of Prevalence Where Present.	Times Reported Usually Severe.	Times Reported Less than Usually Severe.	Difference between "Times more" and "Times less" than Usually Severe.†	Av. Times per Month Reported More than Usually Severe.	Av. Times per Month Reported Less than Usually Severe.	Av. Difference betw "Times More" and "Times Less" Se- vere.‡	AVERAGE ORDER OF PREVA- LENCE WHERE PRESENT.⁴								
												1882.	1881.	1880.	1879.	1878.	1877.	Av. 77.83.		
Average number of Localities repre- sented, 113. Whole number of Observers during the year, 140. Average number of reports compiled, 4,458.† per month, 372. per month, 89.	Average for tabulated Dis- eases reported present. . . . .	43	70	30	4.2	124.7	648.7	256.4	-131.7	10.4	54.1	21.0	10.3	4.2	4.9	4.7	4.4	4.1	4.5	
	Brain, Inflammation of. . . . .	12	45	6	6.6	61	77	71	-10	5.1	6.4	5.9	-8	6.6	8.7	8.1	-----	-----	-----	-----
	Bowels, Inflammation of. . . . .	31	52	16	6.1	123	279	143	-20	10.3	23.3	11.9	-17	6.0	7.4	7.0	-----	-----	-----	-----
	Bronchitis. . . . .	79	83	66	3.2	192	1,633	534	-312	16.0	136.1	41.5	-28.5	3.3	3.9	3.7	3.6	3.3	2.3	3.3
	Cerebro-spinal Meningitis . . . . .	11	47	5	7.4	43	73	78	-35	3.6	6.1	6.5	-2.8	7.2	7.9	7.1	7.4	5.9	6.0	7.0
	Cholera Infantum. . . . .	24	60	14	4.8	78	301	119	-41	6.5	25.1	9.9	-3.4	4.9	5.1	5.2	5.4	5.7	4.9	5.1
	Cholera Morbus. . . . .	32	55	18	5.0	64	436	122	-58	5.3	36.3	10.2	-4.8	5.2	5.3	5.3	5.3	5.7	4.7	5.1
	Consumption, Pulmonary . . . . .	71	86	61	4.5	185	1,816	71	+114	15.4	151.3	5.9	+9.5	4.6	5.6	5.7	5.6	5.2	5.1	5.2
	Croup, Membranous. . . . .	14	42	6	7.1	38	109	79	-41	3.2	9.1	6.6	-3.4	7.0	8.2	7.4	6.6	7.1	6.1	7.1
	Diphtheria. . . . .	31	54	17	5.4	96	296	258	-162	8.0	24.7	21.5	-13.5	4.8	5.6	5.7	5.4	5.4	5.3	5.4
	Diarrhea. . . . .	67	72	49	3.7	159	1,033	522	-363	13.3	86.1	43.5	-30.3	3.8	3.9	4.2	4.4	4.2	3.8	4.0
	Dysentery. . . . .	35	57	21	5.2	85	362	214	-129	7.1	30.2	17.8	-10.8	5.3	5.1	5.8	6.2	5.9	4.9	5.5
	Erysipelas. . . . .	47	54	25	5.5	98	464	296	-198	8.2	38.7	24.7	-8.2	5.5	6.2	6.3	6.5	6.4	5.8	6.0
	Fever, Intermittent. . . . .	82	83	69	2.3	122	1,603	644	-522	10.2	133.6	53.7	-43.5	2.0	2.4	2.3	2.2	2.1	2.2	2.2
Fever, Remittent. . . . .	57	73	41	3.3	155	858	412	-257	12.9	71.5	34.3	-21.4	3.3	3.5	3.3	3.3	3.1	3.1	3.3	
Fever, Typhoid (Enteric). . . . .	19	59	11	5.1	110	175	98	+12	9.2	14.6	8.2	+1.0	5.1	6.2	6.5	7.0	7.0	5.5	6.1	
Fever, Typho-Malarial. . . . .	32	57	18	4.8	131	342	146	-15	10.9	28.5	12.2	-1.3	4.9	5.3	5.5	5.8	5.4	4.7	5.2	

represented, 118.  
Whole number of  
Observers during the year, 140.  
Average number of reports compiled, 4,458.  
per month, 372.  
per month, 28.

FOR THE		56	75	43	3.2	164	908	344	-180	13.7	75.7	28.7	-5.7	3.1	3.5	3.0	3.1	3.1	3.0	3.1
Influenza.....		56	75	43	3.2	164	908	344	-180	13.7	75.7	28.7	-5.7	3.1	3.5	3.0	3.1	3.1	3.0	3.1
Measles.....		37	64	24	3.7	101	536	218	-114	8.7	44.7	18.2	-0.5	4.9	4.4	4.8	4.7	5.3	5.0	4.7
Neuralgia.....		85	81	69	3.3	363	1,516	484	-121	30.3	126.3	40.3	-10.1	3.6	4.3	4.5	4.5	-----	-----	-----
Pneumonia.....		59	65	38	4.7	231	767	258	-27	19.3	63.9	21.5	-2.3	4.4	5.4	5.1	5.2	4.8	4.0	4.8
Puerperal Fever.....		15	43	7	7.3	53	88	72	-19	4.4	7.3	6.0	-1.6	6.2	8.2	7.8	7.2	6.3	6.1	7.0
Rheumatism.....		83	82	68	3.7	288	1,436	658	-370	24.0	110.7	51.8	-30.8	3.8	4.6	4.6	4.6	4.2	4.0	4.2
Scarlatina.....		32	60	19	5.2	79	307	286	-207	6.6	25.6	23.8	-17.3	4.9	6.7	6.5	5.5	5.4	4.8	5.6
Small Pox.....		1	48	-3	14.0	1	12	7	-6	.1	1.0	.6	-5	9.1	8.9	6.3	10.6	3.9	6.8	8.5
Tonsillitis.....		73	68	50	3.9	182	1,151	378	-196	15.2	95.9	31.5	-16.3	3.9	4.5	4.4	4.5	-----	-----	-----
Whooping Cough.....		23	63	15	5.2	36	288	154	-118	3.0	21.0	12.8	-9.8	4.4	6.3	4.8	5.5	4.7	4.8	5.1

\* For Counties in each Division, see Exhibit 1, page 60.

† For number of Observers, reports, weeks in each month, etc., see Exhibit 41, page 202; for names of observers and number of reports received from each see Exhibit 42, page 218.

<sup>a</sup> Not every one of the observers sent in a report for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks.

<sup>b</sup> The numbers in this column (pages 206-7) state not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the average (for the twelve months) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for the year is thus a statement for an average *month*. But on pages 208-11 the numbers in the "Per Cent of Observers" column are statements for the months, and not averages. This column indicates the Area of Prevalence, except that in a few instances there were two or more observers in one city or village.

<sup>c</sup> This column states, for the year or given month, what per cent the number of reports which it is a disease to be present is of the number of cards-reports received, for the given time, from such of the observers as reported that disease present. It is therefore an average not for all localities represented, but only for those at which the given disease was reported present. In the line "Average for Tabulated Diseases," it states what per cent the number of times all diseases were reported present is of the number of times they *might have been* so reported on the cards received, for the time specified, from the observers who during that time reported the diseases present (that is, if each of the observers had on every card he sent reported every disease present which he reported present at all). It will be seen that this is a more accurate average than would be obtained by dividing the sum of the column by the number of diseases reported present.

<sup>d</sup> This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all* observers in the State or Division, as the case may be. It combines and states in a general way an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence. Had every observer sent a report every week of the month or year, the numbers in this column would be (for the State) the product of the numbers in the same line in the two preceding columns.

<sup>e</sup> The disease having the greatest number of cases was to be marked in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals (for the State) of the Order of Prevalence column, in table 3 (a table giving statements for each locality, omitted in printing this Report, for want of room), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented, but only for those at which the given disease was reported present. The number in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa*; but the greater the number of diseases reported present by each observer from week to week, the greater will be the "average," in this column.

<sup>f</sup> The + sign indicates that the times reported "more" exceed those reported "less," except those reported "less," than usually severe. The - sign, that the times reported "less" exceed those reported "more" than usually severe, the number of times by which either exceeds the other being indicated by the numbers stated.

<sup>g</sup> In this statement Jackson and the State Prison at Jackson are counted as separate localities.





DISEASE.	40	56	22	48	11	39	32	-24	45	68	31	4.2	11.7	62.2	24.6	-12.7	41	70	29	4.2	7.2	48.4	29.7	-13.5
Scarlatina.....	40	56	22	48	11	39	32	-24	45	68	31	4.2	11.7	62.2	24.6	-12.7	41	70	29	4.2	7.2	48.4	29.7	-13.5
Small-pox.....	2	70	2	15.0	1	4	2	-1	13	45	6	6.8	4	10	5	-1	11	49	6	6.9	5	7	6	-1
Tonsillitis.....	87	73	64	3.3	34	151	41	-7	82	73	61	3.6	25	120	27	-2	82	74	61	3.7	18	116	32	-14
Whooping-cough.....	22	61	14	5.2	4	28	16	-12	23	61	11	5.1	2	25	13	-11	20	74	11	6.0	0	25	11	-11
Av. for Tab Dis. Rep. Pres.	45	74	33	4.5	10.6	54.8	18.8	-8.3	45	68	31	4.2	11.7	62.2	24.6	-12.7	41	70	29	4.2	7.2	48.4	29.7	-13.5
Brain, Inflammation of...	15	42	7	6.2	8	6	6	+2	13	45	6	6.8	4	10	5	-1	11	49	6	6.9	5	7	6	-1
Bowels, Inflammation of...	32	52	17	6.1	11	25	16	+1	31	51	16	6.0	17	24	13	+4	31	53	16	6.3	6	27	10	-4
Bronchitis.....	85	90	76	3.1	12	147	33	-21	89	79	70	3.1	17	112	59	-42	75	83	62	3.7	5	113	51	-16
Cerebro-spi. Meningitis.	14	48	7	7.3	6	10	4	+2	11	46	6	6.9	6	6	6	0	10	65	6	8.3	2	7	7	-5
Cholera Infantum.....	9	50	5	6.0	1	6	5	-4	13	44	6	6.7	1	12	6	-5	18	48	9	5.6	3	14	9	-6
Cholera Morbus.....	16	50	8	8.2	0	13	8	-8	24	46	11	5.7	3	26	6	-3	31	52	16	5.3	3	29	13	-10
Consumption, Pulmonary	71	92	65	5.0	19	139	5	+14	77	80	62	4.6	18	164	12	+6	69	89	61	4.5	15	137	3	+12
Croup, Membranous.....	19	36	7	7.6	5	6	9	-4	16	38	6	5.4	2	9	9	-7	14	38	5	6.8	1	10	6	-5
Diphtheria.....	32	49	16	5.9	5	22	14	-9	28	63	15	6.2	10	16	19	-9	28	51	14	4.9	6	15	20	-14
Diarrhea.....	53	71	38	5.3	6	59	41	-35	63	60	38	4.7	4	71	43	-39	69	71	49	3.9	11	85	37	-26
Dysentery.....	16	52	9	8.4	1	15	11	-10	24	47	11	6.5	1	18	10	-9	32	52	17	6.0	5	24	12	-7
Erysipelas.....	51	62	31	6.0	8	47	23	-15	54	50	27	4.9	14	53	19	-5	50	54	27	5.5	3	46	22	-19
Fever, Intermittent.....	79	86	68	2.6	8	119	44	-36	85	86	74	1.9	11	163	58	-47	89	83	73	1.8	6	142	50	-44
Fever, Remittent.....	55	75	41	3.7	13	65	28	-15	56	74	42	3.4	13	87	36	-23	59	79	46	2.8	17	73	32	-15
Fever, Typhoid (enteric)	12	58	7	6.7	4	9	7	-3	13	52	6	5.4	5	5	12	-7	17	43	7	5.5	4	10	7	-8
Fever, Typho-malarial..	22	53	12	5.7	5	17	7	-2	31	49	15	5.0	12	31	8	+4	25	55	14	4.5	10	19	7	+3
Influenza.....	73	82	60	3.0	24	91	28	-4	64	47	50	3.1	17	95	41	-24	48	70	33	4.0	1	40	40	-39
Measles.....	56	78	45	3.4	16	76	20	-4	71	71	51	3.1	23	123	35	-12	60	70	42	3.0	11	77	33	-22
Neuralgia.....	93	84	78	3.5	30	130	30	0	86	85	73	3.4	33	167	39	-6	85	80	68	3.3	20	112	53	-33
Pneumonia.....	75	73	55	4.7	31	80	21	+10	76	60	46	4.3	30	74	29	+1	43	61	27	5.2	12	37	9	+3
Puerperal Fever.....	13	50	7	7.3	3	9	7	-4	20	36	7	7.2	5	10	7	-2	13	47	6	7.9	3	8	6	-8
Rheumatism.....	93	86	80	3.9	28	113	55	-27	89	87	77	3.6	40	146	72	-32	85	81	69	3.6	27	110	53	-26
Scarlatina.....	35	65	23	5.6	7	40	17	-10	36	60	22	5.3	6	32	31	-25	28	63	18	5.6	5	22	16	-11
Small-pox.....	0	0	0	0	0	0	0	0	1	20	2	25.0	0	0	0	0	1	75	1	10.0	0	2	1	-1
Tonsillitis.....	81	72	58	4.1	12	102	28	-16	78	68	54	4.2	11	113	43	-32	60	67	41	4.2	4	68	28	-24
Whooping-cough.....	24	67	16	4.9	1	25	10	-9	30	55	17	4.8	2	25	18	-16	19	67	13	5.6	2	24	7	-5

APRIL 4

TABLE 2.—CONTINUED. — Diseases in the State,—July to December, 1883. (For foot-notes and full tabular heads, see pages 206-207.)

DISEASES.	JULY†										AUGUST†										SEPTEMBER†										MONTHS.†																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	Per ct. of Observers	Reporting Pres. of b	Av Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. 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Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b	Av. Per ct. of Weeks Reported Present, a, c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Reported More	Times Reported Usually Severe.	Times Reported Less than usually severe.	Difference between Times "More" and "Less" Severe, f	MONTHS.†	Per ct. of Observers	Reporting Pres. of b



	1	25	03	5.0	0	4	1	- 1	- 14.0	42	70	29	4.2	8.0	40.7	17.4	- 9.4	39	73	28	4.1	8.2	40.0	15.3	7.1
Small-pox.....	43	66	29	4.0	9.8	57.1	23.8			16	42	6	5.8	5	5	5	0	0	0	0	0	0	0	0	0
Tonsillitis.....	66	54	36	4.3	12	57	29	- 17		30	56	17	6.4	8	16	11	- 3	07	63	43	4.5	7	63	35	- 28
Whooping-cough.....	22	54	12	3.9	5	20	7	- 2		23	57	14	5.5	7	24	17	- 10	22	66	14	5.7	5	19	17	- 12
OCTOBER.																									
Av. for Tab. Dis. Rept. Pres.	43	66	29	4.0	9.8	57.1	23.8	- 14.0		42	70	29	4.2	8.0	40.7	17.4	- 9.4	39	73	28	4.1	8.2	40.0	15.3	7.1
Brain, Inflammation of..	9	48	5	7.8	1	9	5	- 4		16	42	6	5.8	5	5	5	0	13	61	8	6.4	8	5	6	+ 2
Bowels, Inflammation of	35	42	15	5.8	11	20	11	0		30	56	17	6.4	8	16	11	- 3	25	53	14	6.8	6	17	9	- 8
Bronchitis.....	73	77	57	3.2	11	146	42	- 31		75	81	61	2.8	16	108	24	- 8	76	90	69	2.6	13	126	21	- 6
Cerebro-spi. Meningitis..	11	34	4	7.1	1	8	3	- 2		10	41	4	7.3	3	8	6	- 3	5	67	3	9.8	5	2	4	+ 1
Cholera Infantum .....	27	52	14	5.5	7	21	12	- 5		12	50	5	8.7	2	6	5	- 3	7	53	2	1.2	0	4	6	- 6
Cholera Morbus .....	31	48	14	5.3	1	23	15	- 14		16	40	6	7.2	2	11	3	- 1	9	52	5	1.0	0	6	6	- 6
Consumption, Pulmonary	69	82	58	4.1	5	165	6	- 1		70	82	58	4.2	16	110	6	+ 10	69	87	60	4.4	13	111	5	+ 10
Croup, Membranous.....	11	38	5	7.2	0	9	6	- 6		16	45	7	7.8	3	7	7	- 4	15	45	7	6.9	4	6	6	- 2
Diphtheria.....	31	48	15	4.9	5	25	26	- 21		34	65	22	5.2	7	22	30	- 23	25	60	15	5.9	6	19	15	- 9
Diarrhea.....	73	70	51	3.3	11	91	58	- 47		58	69	41	4.1	4	51	36	- 32	48	64	30	4.6	2	44	26	- 24
Dysentery.....	40	49	20	5.2	6	25	18	- 12		30	53	16	6.0	8	13	10	- 2	19	57	11	7.1	2	9	4	- 2
Erysipelas.....	51	47	24	5.0	7	39	30	- 23		45	53	24	5.4	1	21	27	- 26	37	60	22	5.7	4	26	18	- 14
Fever, Intermittent.....	86	82	71	1.9	9	156	59	- 50		75	83	62	9.2	7	86	46	- 30	75	80	60	2.6	5	80	45	- 40
Fever, Remittent .....	60	76	45	2.7	12	80	56	- 44		55	72	39	3.2	10	53	29	- 19	45	72	32	3.4	8	35	26	- 18
Fever, Typhoid (enteric)	36	58	21	3.8	21	31	8	+ 13		23	72	17	4.6	7	18	7	0	20	68	14	5.5	8	14	6	+ 2
Fever, Typho-malarial ..	41	70	29	4.4	20	51	22	- 2		40	60	24	4.8	10	25	19	- 9	27	58	15	4.9	3	19	6	- 3
Influenza.....	48	72	35	3.2	9	73	23	- 14		53	73	39	2.9	9	58	20	- 11	63	75	47	2.7	18	68	17	+ 1
Measles.....	18	55	10	4.9	3	17	16	- 13		22	64	14	4.6	3	15	15	- 12	35	58	12	3.0	2	14	13	- 11
Neuralgia.....	82	78	61	3.1	33	132	37	- 4		78	83	65	2.9	21	95	28	- 7	79	87	68	2.8	29	100	27	+ 2
Pneumonia.....	44	51	23	4.8	11	42	10	+ 1		57	59	34	4.7	13	41	19	- 6	65	67	44	4.2	11	61	23	- 12
Puerperal Fever.....	11	40	5	7.0	3	3	5	- 2		13	41	5	8.6	3	4	3	0	17	54	9	6.8	7	7	4	+ 3
Rheumatism.....	80	78	62	3.5	28	127	49	- 21		78	88	69	3.3	19	114	29	- 10	84	83	70	3.3	28	94	42	- 14
Scarlatina.....	26	63	17	4.9	7	17	29	- 22		34	66	22	4.2	6	15	23	- 17	27	65	17	5.4	2	18	13	- 11
Small-pox.....	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis.....	70	67	48	3.7	22	89	34	- 12		75	73	55	3.5	13	96	18	- 6	69	77	54	3.3	14	89	25	- 11
Whooping-cough.....	23	56	14	5.7	1	28	16	- 15		22	74	17	5.1	5	20	10	- 5	27	71	19	4.8	2	25	9	- 7

OCTOBER.



	42	37	41	27	42	33	39	38	30	36	25	40	40	50	23	25	0	0	100	0	40	13	13	26	0	40	100	25	0	0
Tonsillitis.....	23	15	13	18	11	20	0	0	5	16	25	28	20	20	10	20	0	0	0	20	38	13	43	75	0	40	100	25	0	0
Whooping cough.....	34	32	37	37	40	38	36	36	30	33	31	32	33	28	35	36	37	40	38	43	38	36	39	43	39	37	39	41	—	—
Av. for Tab. Dis. Rep. Pr.	45	3	2	0	6	5	4	0	2	4	0	8	12	3	45	3	2	0	2	0	5	0	8	13	4	3	0	0	0	0
Brain, Inflamm. of.....	47	20	12	14	25	23	26	26	16	30	21	19	12	3	47	26	28	23	19	33	23	18	31	33	17	29	39	20	—	—
Bowels, Inflamm. of.....	59	60	76	81	81	85	72	83	51	42	39	37	44	50	76	86	89	94	94	88	73	68	73	80	75	91	100	100	—	—
Bronchitis.....	4	2	0	0	0	3	2	0	4	4	4	0	0	0	5	10	0	0	6	5	15	11	38	17	13	17	17	0	—	—
Cerebro-spinal Men.....	17	20	10	6	9	10	4	3	27	45	47	33	4	3	17	14	0	2	0	5	0	7	42	67	50	29	9	5	—	—
Cholera Infantum.....	23	22	5	8	3	0	16	11	45	51	47	19	0	3	21	20	6	8	13	19	10	11	38	73	46	26	9	15	—	—
Cholera Morbus.....	51	59	67	50	56	74	78	71	63	58	47	56	40	33	73	77	74	73	77	75	71	73	77	83	77	83	100	100	—	—
Consumption, Pulm.....	8	6	17	6	0	10	6	9	10	4	2	4	0	0	11	11	18	21	9	5	3	4	12	10	4	9	17	25	—	—
Croup, Membranous.....	34	8	29	28	13	3	4	6	6	6	4	4	0	0	33	23	32	29	32	21	3	7	19	13	17	23	43	35	—	—
Diphtheria.....	48	53	38	31	38	38	40	54	73	81	75	54	36	30	51	52	35	46	43	47	50	71	77	97	67	57	30	25	—	—
Diarrhea.....	29	26	10	11	19	5	10	9	27	66	57	27	8	17	21	18	6	6	11	14	18	18	46	50	33	25	13	15	—	—
Dysentery.....	31	20	43	50	38	44	38	34	22	21	18	27	28	13	27	37	43	40	49	53	45	25	35	23	29	20	22	10	—	—
Erysipelas.....	78	76	64	53	59	69	82	86	88	87	86	87	72	50	86	78	71	75	79	85	93	92	77	83	77	61	70	—	—	—
Fever, Intermittent.....	70	51	50	31	34	31	43	57	41	55	61	77	60	50	51	35	25	33	28	47	50	29	42	47	50	40	22	15	—	—
Fever, Remittent.....	13	9	7	0	9	10	14	6	6	10	14	23	0	0	8	10	6	4	6	0	0	0	4	39	25	23	26	20	—	—
Fever, Typhoid (Entere).....	28	27	33	42	34	21	22	14	12	16	22	52	36	27	32	23	28	17	11	16	20	7	12	33	46	37	39	15	—	—
Fever, Typho-mal.....	49	40	55	67	63	82	60	26	18	19	10	25	36	50	45	48	52	60	64	56	50	32	27	30	42	46	39	45	—	—
Influenza.....	15	25	21	25	47	51	58	43	25	4	0	8	12	17	17	32	11	10	21	79	78	75	58	23	4	3	13	15	—	—
Measles.....	473	67	81	72	75	79	78	83	61	60	61	62	48	47	473	79	82	85	89	81	73	71	73	77	71	77	70	80	—	—
Neuralgia.....	46	41	79	83	91	72	48	11	8	16	31	17	24	40	48	41	48	58	64	56	25	32	27	28	29	23	30	50	—	—
Pneumonia.....	8	4	17	6	3	3	10	0	6	0	2	2	0	0	5	4	6	0	6	5	5	11	8	3	0	6	0	0	—	—
Puerperal Fever.....	62	67	67	58	69	87	90	83	71	58	45	62	72	50	78	84	92	90	87	98	83	79	65	70	63	77	83	95	—	—
Rheumatism.....	27	19	14	11	16	13	12	20	22	10	11	25	52	33	21	18	18	17	21	23	15	25	15	0	21	20	22	25	—	—
Scarlatina.....	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7	0	0	0	0	0	0	0	0	0	0	0	0	0	—	—
Small-pox.....	59	51	83	75	84	79	68	49	37	37	43	35	32	27	58	61	68	63	62	70	58	43	46	33	42	63	78	100	—	—
Tonsillitis.....	19	12	12	6	19	10	12	17	6	15	22	12	4	3	25	19	12	17	15	23	20	11	15	20	21	31	22	25	—	—
Whooping-cough.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

WESTERN DIVISION.\*

\*, f, d. See page 207.  
 † For inflam. of brain, and inflam. of bowels, an average for the 4 years 1880-83; for neuralgia and tonsillitis, an average for the 5 years 1879-83; for the Northern Division 1882-83; for other diseases, and for the av. line, an av. for the 7 years 1877-83.



TABLE 2.—CONTINUED.—Diseases in the Central, the Southwestern, the Southern-Central, and the Southeastern Divisions\* of the State for the Years 1877-1883, and by Month† in 1883.—Indicating what Per Cent of the Weekly Reports Received Stated Presence of the Diseases Named.<sup>a</sup>

DISEASES.	1883. †	CENTRAL DIVISION.*												SOUTHWESTERN DIVISION.*												1883. †	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		1877-83. †	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	1877-83. †	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.													
(Av. for Tab. Dis. Rep. Pr.	27	27	27	29	32	27	25	26	29	28	24	25	22	29	27	35	34	34	37	32	28	31	32	37	33	31	39	Dec.										
Brain, Inflammat'n of	46	6	1	8	9	10	9	7	5	6	2	4	8	+	8	3	0	17	15	0	8	20	3	3	6	5	25	8										
Bowels, Inflamm'n of	41	13	6	4	7	15	11	18	14	21	15	10	15	10	14	9	21	8	12	11	4	17	29	16	15	15	8											
Bronchitis	52	57	65	70	69	58	44	53	54	57	49	48	59	53	49	65	71	58	54	61	54	37	26	29	36	55	54											
Cerebro-spinal Men...	3	3	0	10	11	6	1	3	3	1	3	5	0	1	5	0	0	0	15	4	12	3	5	6	0	5	17	0										
Cholera Infantum	12	12	5	7	8	3	6	19	42	28	9	2	1	22	16	3	0	0	0	4	4	4	53	32	9	10	0	0										
Cholera Morbus	14	18	13	14	13	11	14	26	31	38	28	8	9	14	10	9	4	0	0	4	4	27	34	16	0	10	0	0										
Consumption, Pulm'ry	62	50	63	63	67	51	48	53	48	44	46	40	37	74	51	82	68	51	54	43	38	43	50	48	55	55	58	4										
Croup, Membranous	3	2	4	6	3	3	3	2	0	1	1	1	2	1	4	5	3	4	4	12	4	0	8	0	9	10	4	0										
Diphtheria	27	15	23	18	16	22	21	18	11	8	7	7	17	11	16	10	15	4	4	0	18	8	13	11	10	15	10	8	0									
Diarrhea	41	37	19	17	20	17	26	32	56	81	74	33	30	19	40	42	29	21	25	31	43	42	67	82	77	39	20	0	0									
Dysentery	14	16	4	6	4	0	6	15	19	46	52	15	11	5	13	7	0	0	0	0	0	13	18	42	0	0	0	0	0									
Erysipelas	16	18	18	23	17	17	21	21	12	17	16	23	16	14	20	26	32	32	25	15	21	15	13	29	39	21	30	32	0									
Fever, Intermittent	77	65	46	56	45	57	67	67	71	74	76	72	68	63	83	83	74	71	79	85	86	69	90	92	94	82	80	88	0									
Fever, Remittent	51	35	29	15	31	33	35	43	36	43	49	38	39	24	54	46	50	54	38	51	25	46	60	50	58	48	25	38	0									
Fever, Typhoid (enteric)	14	6	0	0	7	0	5	8	4	5	10	12	11	6	7	8	15	14	13	19	0	4	0	5	6	9	0	4	0									
Fever, Typho-malarial	20	13	9	10	5	6	11	15	5	20	21	22	16	13	22	18	29	18	29	12	4	12	10	24	32	15	25	8	0									
Influenza	36	40	48	70	80	61	43	28	22	18	20	31	34	48	44	49	59	46	79	38	46	27	30	21	45	64	80	71	0									
Measles	12	20	13	17	33	47	49	36	25	13	9	3	2	4	12	27	29	43	50	69	64	54	13	0	0	12	0	0	0	0								
Neuralgia	56	64	78	72	75	71	66	57	54	56	57	64	68	61	72	74	71	75	54	88	71	69	77	66	81	76	80	83	0									
Pneumonia	36	30	42	61	49	46	45	22	12	4	15	17	24	40	33	25	32	43	50	31	25	8	13	18	16	3	25	42	0									
Puerperal Fever	5	4	3	6	4	4	6	2	2	7	3	0	2	8	2	7	0	4	4	8	0	15	13	11	0	0	15	21	0									
Rheumatism	58	62	72	68	68	78	65	53	60	54	49	59	65	60	73	60	82	71	58	73	54	46	40	58	58	55	60	67	0									
Scarlatina	15	13	13	10	15	21	11	11	11	15	18	11	16	6	15	3	0	0	13	4	14	0	0	8	0	0	0	0	0	0								
Small-pox	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	2	15	4	0	0	0	0	0	0	0	6	0	0	0	0								

Tonsillitis.....	429	41	58	59	51	31	34	31	34	39	35	43	40	41	44	38	29	38	46	46	42	37	45	48	48	60	50	
Whooping-cough.....	19	13	11	10	11	21	26	14	22	15	7	9	7	5	15	12	0	7	17	0	6	15	20	21	16	0	39	29
Av. for Tab. Dis. Rep. Pr.	29	30	33	34	34	37	36	29	30	33	34	31	33	34	37	40	41	43	44	47	43	40	39	42	43	38	40	
Brain, Inflammat'n of	4	3	0	4	0	1	0	4	7	3	7	0	8	2	46	19	13	22	19	22	17	15	11	18	25	23	21	23
Bowels, Inflamm'n of...	411	13	10	13	8	4	7	4	15	31	21	10	15	22	423	28	15	16	25	44	35	33	25	36	28	26	26	23
Bronchitis.....	67	70	83	82	86	74	76	66	59	58	52	65	58	69	69	72	80	91	97	91	83	56	64	58	53	53	71	80
Cerebro-spinal Men...	4	2	3	3	3	0	0	0	3	4	8	1	3	0	7	12	13	16	13	13	13	21	11	11	14	9	3	11
Cholera Infantum.....	10	10	3	2	1	0	2	7	25	42	27	1	2	0	17	22	0	0	6	13	23	21	36	53	36	26	15	20
Cholera Morbus.....	18	17	5	10	0	1	4	10	35	63	44	15	3	2	23	27	0	0	16	28	29	26	50	67	44	28	15	14
Consumption, Pulm'y	63	62	65	67	65	62	67	71	61	47	53	51	65	74	84	87	93	100	100	83	79	81	84	83	81	82	80	80
Croup, Membranous..	4	3	5	7	5	3	0	3	0	0	3	1	6	2	14	17	15	16	16	22	15	13	11	11	31	19	15	23
Diphtheria.....	16	10	12	10	9	13	4	4	3	10	8	11	24	15	34	43	70	53	47	44	38	46	36	29	33	30	56	43
Diarrhea.....	43	48	28	41	27	35	27	40	62	81	82	60	52	35	55	53	40	31	44	44	46	54	75	73	78	56	53	34
Dysentery.....	16	19	8	7	1	0	4	10	27	55	71	20	16	7	28	30	18	13	25	31	29	28	31	56	47	28	29	23
Erysipelas.....	20	20	18	29	26	24	8	18	21	11	14	27	29	22	34	45	50	59	56	50	52	51	50	36	28	33	29	46
Fever, Intermittent..	83	79	63	78	77	81	89	93	92	85	81	75	71	65	79	71	58	63	66	69	73	67	81	84	94	77	65	57
Fever, Remittent.....	57	56	46	47	41	53	62	66	61	67	66	59	58	48	49	41	40	38	47	50	44	38	36	44	44	40	32	34
Fever, Typhoid (enteric)	9	10	13	11	3	0	4	3	7	6	16	25	18	15	27	27	20	13	19	28	17	23	14	33	47	35	44	31
Fever, Typho-malarial	19	16	8	11	6	12	8	7	10	20	44	30	27	9	31	26	25	13	25	13	27	26	22	36	42	33	29	11
Influenza.....	36	45	53	65	70	59	55	40	28	19	26	33	35	44	49	45	53	72	66	52	42	38	25	31	36	41	47	43
Measles.....	12	21	24	23	15	18	42	35	24	7	12	19	24	15	22	35	18	22	38	50	63	49	36	27	22	23	29	37
Neuralgia.....	465	74	79	78	80	82	87	81	69	55	62	67	71	83	459	66	68	75	75	69	71	64	69	61	58	53	62	66
Pneumonia.....	37	42	62	63	74	55	46	35	17	11	14	27	48	44	49	54	75	75	69	72	60	41	31	33	44	56	44	57
Puerperal Fever.....	3	5	10	3	2	0	7	1	4	4	8	6	5	9	9	20	13	22	22	22	21	18	11	24	25	19	18	23
Rheumatism.....	68	67	70	66	64	69	87	76	65	50	58	63	65	76	75	81	78	81	78	97	92	85	78	76	72	70	68	94
Scarlatina.....	16	19	29	27	31	18	20	6	13	8	14	15	23	26	33	38	40	59	44	59	50	38	39	24	22	23	29	34
Small-pox.....	0.8	0.4	0	0	0	0	0	4	1	0	0	0	0	0	5.1	1	5	6	0	0	2	0	0	0	0	0	0	0
Tonsillitis.....	47	56	63	67	64	54	65	41	31	36	45	64	69	76	49	53	70	66	63	63	73	38	42	31	50	41	50	46
Whooping-cough.....	19	15	24	25	18	18	19	4	4	6	8	9	19	22	29	21	13	13	22	19	21	23	11	16	22	23	24	46

SOUTHERN, CENTRAL DIVISION.\*

SOUTHEASTERN DIVISION.\*

\* For inflam. of brain and inflam. of bowels, an av. for the 4 years 1880-83; for neuralgia and tonsillitis an av. for the 5 years 1879-83; for other diseases and for av. line an average for the 7 years 1877-83.

†, d. - see page 207.

TABLE 2.—CONTINUED.—Diseases in the Northwestern Division\* for the Years 1879-83, and by Month† in 1883, and in the Northern-Central Division\* for the Years 1880-83, and by Month† in 1883. Indicating on what Per Cent of the Weekly Reports Received the Diseases named were Reported Present.<sup>a</sup>

DISEASES.	NORTHERN CENTRAL DIVISION.*													1883 †
	79-83.	1883 †	Jan. †	Feb. †	March. †	April. †	May †	June †	July. †	Aug. †	Sept. †	Oct. †	Nov. †	
(Average for Tabulated { Dis. Reported Present {	79-83.	1883 †	Jan. †	Feb. †	March. †	April. †	May †	June †	July. †	Aug. †	Sept. †	Oct. †	Nov. †	Dec. †
Brain, Inflammation of	42	0	0	0	0	0	0	0	0	0	0	0	0	0
Bowels, Inflamm. of	49	7	0	13	13	0	0	0	0	0	0	0	5	0
Bronchitis.	61	62	70	63	88	75	73	83	58	27	50	60	50	71
Cerebro-spinal Men.	3	2	0	0	0	0	0	0	0	0	0	0	0	0
Cholera Infantum.	26	27	0	0	0	0	13	8	58	93	75	10	0	0
Cholera Morbus.	24	35	0	0	13	13	25	53	67	67	67	80	25	50
Consumption, Pulm.	32	58	10	38	25	50	53	58	67	67	67	80	25	50
Croup, Membranous.	9	2	0	13	0	13	0	0	0	0	0	0	0	0
Diphtheria	21	23	30	50	0	0	60	8	0	20	17	50	13	14
Diarrhea.	61	90	40	50	83	100	100	100	100	100	100	88	45	35
Dysentery.	30	44	10	25	13	0	27	50	25	73	100	70	75	27
Erysipelas.	39	30	30	50	13	25	47	58	8	27	0	20	38	33
Fever, Intermittent.	82	100	100	100	100	100	100	100	100	100	100	100	100	100
Fever, Remittent.	38	43	30	13	38	38	33	58	67	67	50	40	50	0
Fever, Typhoid (En.).	9	1	10	0	0	0	0	0	0	0	0	0	0	0
Fever, Typho-mal.	32	36	40	13	25	0	33	33	33	42	60	50	71	31
Influenza.	46	58	70	50	88	40	49	33	40	67	80	50	86	12
Measles.	20	14	20	0	13	0	13	50	25	13	8	0	0	0
Neuralgia.	71	68	60	50	63	75	67	58	67	75	90	100	57	51
Pneumonia.	37	53	60	75	100	88	87	50	17	27	42	20	38	37
Puerperal Fever.	6	10	0	0	38	13	0	0	17	33	17	0	0	5
Rheumatism.	76	72	90	75	75	63	73	58	67	80	58	70	100	57
Scarlatina.	25	76	80	88	88	38	93	92	58	47	83	100	88	57
Small-pox.	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Tonsillitis.	60	64	100	88	63	88	53	75	67	27	50	70	50	71
Whooping-cough.	25	18	0	0	0	0	0	0	0	0	25	70	100	71

\* For only the 4 years 1880-83.

\*, †, ‡ For these references, see foot-notes page 207.



TABLE 2.--CONTINUED.—Diseases in Northeastern Division of the State for the Year 1883, and by Months in 1883. Indicating What Per Cent of the Weekly Reports received Stated the Presence of the Diseases Named.

DISEASES.	NORTHEASTERN DIVISION.*												
	1883.†	Jan.†	Feb.†	Mar.†	Apr.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†
Av. for Tabulated Diseases Reported Present.	37	64	75	67	71	43	46	51	53	57	46	54	51
Brain, Inflammation of.....	2	0	0	25	0	11	0	0	0	0	0	0	0
Bowels, Inflammation of.....	32	20	50	50	50	33	25	38	22	50	30	13	25
Bronchitis.....	88	100	100	100	100	100	88	63	44	100	90	100	100
Cerebro-spinal Meningitis.....	4	0	0	0	25	22	0	0	0	0	0	0	0
Cholera Infantum.....	18	0	0	0	0	22	13	13	22	38	30	38	0
Cholera Morbus.....	16	0	0	0	0	0	13	63	22	63	10	0	0
Consumption, Pulmonary.....	85	100	100	100	100	56	75	100	100	100	100	63	50
Croup, Membranous.....	18	40	50	25	25	22	13	0	0	13	10	25	25
Diphtheria.....	0	0	0	0	0	0	0	0	0	0	0	0	0
Diarrhea.....	86	100	100	100	75	67	88	88	100	100	80	88	63
Dysentery.....	27	20	0	50	25	22	25	13	78	38	20	0	25
Erysipelas.....	19	20	0	0	0	0	0	38	22	0	30	50	38
Fever, Intermittent.....	13	20	25	25	0	0	13	0	78	0	0	0	0
Fever, Remittent.....	42	60	25	25	0	33	50	50	33	63	40	50	50
Fever, Typhoid (Enteric).....	6	0	0	0	0	0	13	0	0	0	0	0	0
Fever, Typho Malarial.....	11	0	0	0	50	22	13	0	0	0	10	13	0
Influenza.....	29	60	0	0	0	22	0	25	33	38	20	0	0
Measles.....	25	0	0	0	0	22	38	38	22	38	50	38	13
Neuralgia.....	95	100	100	100	100	89	88	100	100	100	90	88	100
Pneumonia.....	47	60	75	0	100	67	50	25	33	13	60	25	75
Puerperal Fever.....	5	0	0	0	0	0	13	0	0	0	10	0	25
Rheumatism.....	86	100	100	100	100	67	75	75	89	75	70	100	100
Scarlatina.....	20	0	0	0	0	11	38	25	33	0	40	50	0
Small-pox.....	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis.....	92	100	100	100	100	89	100	75	78	75	100	100	100
Whooping Cough.....	9	0	0	0	0	33	50	0	0	0	0	0	13

TABLE 4.—A Summary for the Year 1883, relative to the Diseases in each of the Six Divisions of the State from which the most Weekly Reports were received, — Indicating the prevalence as regards both Time and Area.

DISEASES.	WESTERN DIVISION.*				BAY AND EASTERN.*				CENTRAL DIV.*				SOUTHWESTERN DIV.*				S. CENTRAL DIV.*				SOUTHEASTERN DIV.*				
	Per Cent of Observed Reporting Present.	Per Cent of Reports Where Present.	Av. Order of Prevalence Where Present.	Per Cent of Observed Reporting Present.	Per Cent of Reports Where Present.	Av. per cent. of Weeks Reported Present.	Per Cent of Observed Reporting Present.	Per Cent of Reports Where Present.	Av. Order of Prevalence Where Present.	Per Cent of Observed Reporting Present.	Per Cent of Reports Where Present.	Av. per cent. of Weeks Reported Present.	Per Cent of Observed Reporting Present.	Per Cent of Reports Where Present.	Av. per cent. of Weeks Reported Present.	Per Cent of Observed Reporting Present.	Per Cent of Reports Where Present.	Av. Order of Prevalence Where Present.	Per Cent of Observed Reporting Present.	Per Cent of Reports Where Present.	Av. per cent. of Weeks Reported Present.	Per Cent of Observed Reporting Present.	Per Cent of Reports Where Present.	Av. Order of Prevalence Where Present.	
Average for Tabulated Diseases Reported Present.	42	32	4.2	49	73	35	5.0	42	63	27	3.2	40	68	27	3.7	40	74	30	4.0	51	77	40	6.5	4.0	
Brain, Inflammation of ...	10	32	3	9	30	3	8.0	15	43	6	3.4	18	45	8	4.0	9	34	3	5.9	26	70	19	13.1	3	
Hoovels, Inflammation of.	38	52	20	44	58	26	7.0	29	44	13	4.4	27	53	14	4.2	23	56	13	5.5	41	68	28	11.6	13	
Bronchitis.	29	82	60	34	87	89	86	3.0	73	79	57	63	77	49	3.4	83	84	70	3.2	87	83	72	3.4	70	
Cerebro-spinal Meningitis	6	26	2	3.9	17	60	10	7.4	10	37	3	13	40	5	4.7	6	43	2	6.0	17	70	12	18.4	6	
Cholera Infantum	31	65	20	4.2	23	62	14	5.5	24	51	12	3.9	26	63	16	4.0	16	60	10	4.6	29	72	22	8.5	16
Cholera Morbus.	37	58	22	4.1	38	53	20	6.6	35	52	18	4.1	26	38	10	4.2	27	62	17	4.1	40	68	27	8.5	17
Consumption, Pulmonary	71	83	50	4.7	84	92	7.2	65	77	50	3.4	61	89	54	5.0	71	86	62	5.2	92	95	87	4.2	42	
Croup, Membranous.	15	38	6	5.2	27	42	11	7.6	8	28	2	3.3	12	36	5	4.3	7	41	3	6.9	28	59	17	12.0	7
Diphtheria...	19	42	8	4.7	46	51	23	6.7	31	48	15	3.4	21	40	10	4.0	21	50	10	5.8	60	72	43	7.2	21
Diarrhea	69	76	53	3.6	68	76	52	4.5	60	62	27	2.8	63	66	42	3.7	65	73	48	3.5	73	71	53	5.6	44
Dysentery.	43	59	26	4.4	33	55	18	6.8	31	16	3.6	13	52	7	4.5	23	68	19	4.5	44	67	30	9.6	60	
Erysipelas.	56	55	30	5.0	63	58	27	6.2	40	45	18	3.8	50	50	26	4.9	38	54	20	5.5	60	74	45	8.5	54
Fever, Intermittent.	89	85	76	2.0	88	89	78	2.3	83	78	65	2.0	91	90	83	2.3	89	89	79	2.4	87	82	71	2.9	87
Fever, Remittent.	63	75	51	3.3	50	71	35	4.7	54	66	35	2.4	72	65	46	3.1	67	83	56	3.4	53	77	41	4.8	65
Fever, Typhoid (enteric).	18	54	9	4.5	15	67	10	5.3	12	50	6	3.2	13	57	8	2.7	13	73	10	5.0	42	65	27	7.5	36
Fever, Typho-malarial	48	56	27	4.2	39	57	23	5.7	26	50	13	3.7	35	52	18	4.7	26	58	16	6.1	36	71	26	4.6	51
Influenza	53	74	40	3.0	59	80	48	3.7	59	68	40	2.7	61	80	49	2.9	57	79	45	2.8	56	81	45	5.0	75
Measles	37	65	25	3.4	45	73	32	4.3	37	59	20	2.4	40	68	27	3.0	32	65	21	3.4	46	75	35	7.2	76
Neuralgia	81	84	67	3.3	88	89	79	3.2	84	76	64	2.7	95	78	74	3.2	87	85	74	3.2	76	86	66	4.3	74
Pneumonia	60	67	41	4.3	61	68	41	6.3	50	60	30	3.7	45	54	25	4.4	50	71	42	4.2	74	73	54	5.9	73
Puerperal Fever	12	31	4	5.2	11	39	4	7.7	12	34	4	4.2	13	53	7	3.9	12	39	5	6.0	30	65	20	14.7	88
Rheumatism	85	78	67	3.8	90	93	84	4.0	81	76	62	3.1	71	85	60	3.8	81	82	67	3.8	92	88	81	4.7	73
Scarlatina	31	60	19	4.1	34	55	18	6.2	26	50	13	3.7	10	31	3	5.1	32	61	19	5.7	52	73	38	7.2	36
Small-pox.	0	0	0	0.0	0	0	0	0	0	0	0	0	2	67	2	6.5	1	50	0.4	7.5	3	36	1	23.3	78
Tonsillitis.	69	77	54	4.0	77	78	61	5.1	73	56	41	3.4	71	62	41	3.6	78	71	56	3.8	67	78	53	4.2	75
Whooping-cough.	23	50	12	4.3	31	59	19	6.7	22	59	13	3.7	20	66	12	2.9	92	68	15	4.7	27	75	21	11.0	68

\* For counties in each division see Exhibit 1, page 63.

b, c, d, e. See foot-notes with these marks, in Table 2, page 207.

EXHIBIT 42.—By Months and by Geographical Divisions of the State, the Names of 140 Observers whose Weekly Reports of Diseases for 1883 are compiled in Tables 1, 2, 3, and 4, the Localities<sup>a</sup> for which they Report, and the Number of Reports received from each Observer.

DIVISIONS AND LOCALITIES REPRESENTED, AND PHYSICIANS WHO REPORTED. <sup>a</sup>	WEEKLY REPORTS IN 1883.—COMPILED ON PAGES 201-218.												
(Health Officers in Italics; those also Correspondents marked with a *.)	YEAR 1883.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
ALL LOCALITIES.....†	4458	444	357	345	332	417	343	371	475	361	422	298	293
UPPER PENINSULAR DIVISION.....†	254	34	22	19	15	18	16	20	25	20	25	20	20
Hancock, <i>T. U. Planner, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Houghton, <i>H. W. Jones, M. D.</i> .....	50	4	3	4	4	5	4	4	5	4	5	4	4
Mackinac, <i>S. S. Jessop, M. D.</i> .....	39	5	4	4	—	—	—	4	5	4	5	4	4
Marquette, <i>A. Klein Thiel, M. D.</i> .....	5	5	—	—	—	—	—	—	—	—	—	—	—
Negaunee, <i>C. S. Lombard, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Ontonagon, <i>H. E. Cary, M. D.</i> .....	17	5	3	3	3	3	—	—	—	—	—	—	—
Sault Ste. Marie, <i>G. A. Harding, M. D.</i> .....	30	—	—	—	—	—	4	4	5	4	5	4	4
Sault Ste. Marie, <i>A. E. Bacon, M. D.</i> .....	9	5	4	—	—	—	—	—	—	—	—	—	—
NORTHWESTERN DIVISION.....†	125	10	8	8	8	15	12	12	15	12	10	8	7
Manistee, <i>J. Kinsley, M. D.</i> .....	39	5	4	4	4	5	4	4	5	4	—	—	—
Manistee, <i>D. E. Robinson, M. D.</i> .....	34	—	—	—	—	5	4	4	5	4	5	4	3
Manton, <i>J. B. Martin, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
NORTHERN DIVISION.....†	69	5	4	4	4	5	8	8	14	4	5	4	4
Charlevoix, <i>W. M. Preston, M. D.</i> .....	35	—	—	—	—	5	4	4	5	4	5	4	4
Gaylord, <i>J. Robinson, M. D.</i> .....	29	5	4	4	4	—	4	4	4	—	—	—	—
Mackinaw City, <i>S. J. Power, M. D.</i> .....	5	—	—	—	—	—	—	—	5	—	—	—	—
NORTHEASTERN DIVISION.....†	85	5	4	4	4	9	8	8	9	8	10	8	8
Alpena, <i>W. F. Wilson, M. D.</i> .....	33	—	—	—	—	4	4	4	4	4	5	4	4
East Tawas, <i>J. S. Reeves, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
WESTERN DIVISION.....†	510	42	36	32	39	50	35	51	67	51	52	25	30
Casnovia, <i>C. E. Koon, M. D.</i> .....	41	5	4	4	4	5	3	4	5	4	3	—	—
Cedar Springs, <i>C. S. Ford, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Free Soil, <i>W. J. Bruce, M. D.</i> .....	18	—	—	—	—	3	—	4	5	3	3	—	—
Grand Haven, <i>A. Vander Veer,*</i> .....	18	5	4	4	4	1	—	—	—	—	—	—	—
Grand Haven, <i>J. B. McNett, M. D.</i> .....	25	—	—	—	—	4	4	4	5	4	5	—	—
Grand Rapids, <i>A. Hazlewood, M. D.</i> .....	50	5	4	4	4	5	3	4	5	4	5	3	4
Grand Rapids, <i>C. H. Maxim, M. D.</i> .....	14	—	—	—	—	4	3	4	3	—	—	—	—
Grandville, <i>A. A. Weston, M. D.</i> .....	31	—	—	—	4	3	3	4	5	4	4	—	4
Hersey, <i>G. V. Chamberlain, M. D.</i> .....	7	3	4	—	—	—	—	—	—	—	—	—	—
Hersey, <i>E. Halsey Wood, M. D.</i> .....	13	—	—	—	—	—	—	4	5	4	—	—	—
Hesperia, <i>J. A. Porter, M. D.</i> .....	16	—	—	—	—	—	—	3	5	4	4	—	—
Lowell, <i>O. C. McDannell, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Ludington, <i>A. P. McConnell, M. D.</i> .....	16	5	4	4	3	—	—	—	—	—	—	—	—
Ludington, <i>P. P. Shorts, M. D.</i> .....	39	—	—	—	4	5	4	4	5	4	5	4	4
Muskegon, <i>J. F. Denslow, M. D.</i> .....	24	4	4	4	4	5	3	—	—	—	—	—	—
Muskegon, <i>Gilbert Chaddock, M. D.</i> .....	7	—	—	—	—	—	—	—	—	—	—	3	4
N. Muskegon, <i>N. W. Andrews, M. D.</i> .....	51	5	4	4	4	5	4	4	5	4	5	4	3
White Cloud, <i>H. T. Reed, M. D.</i> .....	16	—	—	—	—	—	—	4	5	4	3	—	—
Whitehall, <i>J. H. Johnson, M. D.</i> .....	19	—	—	—	—	—	—	—	4	4	5	3	3
NORTH-CENTRAL DIVISION.....†	168	15	12	12	11	19	16	12	17	15	19	12	8
Big Rapids, <i>J. W. Badger, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Farwell, <i>E. E. Bracy, M. D.</i> .....	34	—	—	—	—	4	4	4	5	4	5	4	4
Mecosta, <i>J. S. Witter, M. D.</i> .....	9	—	—	—	—	5	4	—	—	—	—	—	—
Mt. Pleasant, <i>M. F. Pasquello, M. D.</i> .....	17	—	—	—	—	—	—	—	4	4	5	4	—
Mt. Pleasant, <i>L. J. King, M. D.</i> .....	16	5	4	4	3	—	—	—	—	—	—	—	—
Roscommon, <i>W. S. Washington, M. D.</i> .....	40	5	4	4	4	5	4	4	3	3	4	—	—
BAY AND EASTERN DIVISION.....†	429	65	48	47	43	40	28	26	30	24	35	23	20
Bay City, <i>W. R. Marsh, M. D.</i> .....	26	5	4	4	4	5	4	—	—	—	—	—	—
Brooklyn, <i>A. Hutchell, M. D.</i> .....	47	5	4	4	4	5	4	4	5	4	5	3	—
Chesaning, <i>H. W. Marsh, M. D.</i> .....	5	5	—	—	—	—	—	—	—	—	—	—	—
East Saginaw, <i>S. Kuehn, M. D.*</i> .....	42	5	4	4	4	—	—	3	5	4	5	4	4
Lapeer, <i>H. McCall, M. D.</i> .....	16	5	4	4	3	—	—	—	—	—	—	—	—
Lexington, <i>A. M. Oldfield, M. D.</i> .....	22	5	4	4	4	5	—	—	—	—	—	—	—
Port Huron, <i>D. M. Bennett, M. D.</i> .....	17	5	4	4	4	—	—	—	—	—	—	—	—
Port Huron, <i>A. A. Whitney, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Saginaw City, <i>P. B. Florentine, M. D.</i> .....	12	5	4	3	—	—	—	—	—	—	—	—	—

<sup>a</sup> In many cases the reports include sickness in the vicinity as well as in the corporate limits of the places named.

\* Health Officer and Correspondent.

† For counties in each division see Exhibit 1, page 59.



## EXHIBIT 42.—CONTINUED.

DIVISIONS AND LOCALITIES REPRESENTED, AND PHYSICIANS WHO REPORTED.

(Health Officers in *italic*; those also Correspondents marked with a \*.)

WEEKLY REPORTS IN 1883.—COMPILED ON PAGES 201-218.

	YEAR 1883.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<b>BAY AND EASTERN DIV.—Continued.</b> †													
Saginaw City, <i>N. D. Lee, M. D.*</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
St. Clair, <i>W. H. Smith, M. D.*</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Thornville, <i>J. S. Cantkins, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
W. Bay City, <i>J. W. Haushurst, M. D.*</i> .....	34	5	4	4	4	5	4	3			5		
<b>CENTRAL DIVISION.</b> .....†	1054	79	71	75	72	100	87	97	112	87	109	82	83
Bancroft, <i>Alex. under Shaw, M. D.</i> .....	25					4	4	4	5	4	4		
Fenton, <i>I. N. Brainerd, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Flint, <i>A. A. Thompson, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Greenville, <i>John Avery, M. D.</i> .....	22					5	4	4	5	4			
Greenville, <i>C. S. Sheldon, M. D.</i> .....	43	5		4	4	5		3	5	4	5	4	4
Hastings, <i>A. P. Drake, M. D.</i> .....	47		4	4	4	5	4	4	5	4	5	4	4
Hastings, <i>D. E. Fuller, M. D.</i> .....	35					5	4	4	5	4	5	4	4
Howard City, <i>J. N. Hathaway, M. D.</i> .....	20							4		3	5	4	4
Howell, <i>H. R. Hitchcock, M. D.</i> .....	43	5	4	4	4	5	4	4			5	4	4
Hoytville, <i>O. S. Bailey, M. D.</i> .....	3							3					
Hubbardston, <i>J. H. Bucheler, M. D.</i> .....	39				4	5	4	4	5	4	5	4	4
Hubbardston, <i>J. J. Robbins, M. D.</i> .....	13	5	4	4									
Ionia, <i>S. F. Romig, M. D.</i> .....	35					5	4	4	5	4	5	4	4
Ithaca, <i>C. W. Marvin, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Lakeview, <i>C. O. Adams, M. D.</i> .....	7		3	4									
Lakeview, <i>A. H. Forsyth, M. D.</i> .....	32					4	4	4	5	4	5	3	3
Lansing, <i>J. H. Wellings, M. D.</i> .....	17	5	4	4	4			4	5	4	5	4	4
Lansing, <i>O. Marshall, M. D.</i> .....	34					4	4	4	5	4	5	4	4
Linden, <i>J. P. Corcoran, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Mason, <i>A. B. Campbell, M. D.</i> .....	17	5	4	4	4								
Maple Rapids, <i>W. F. Reed, M. D.</i> .....	24			4	4	5	4					3	4
Middleville, <i>G. W. Mutton, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Otisville, <i>C. A. Wisner, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Owosso, <i>A. J. Robb, M. D.</i> .....	43		4			5	4	4	5	4	5	4	4
Pewamo, <i>G. T. Hine, M. D.</i> .....	16	4	4	4	4								
Pinckney, <i>H. F. Sigler, M. D.</i> .....	22						4	4	5	4	5		
Sheridan, <i>W. H. Budd, M. D.</i> .....	10						3	4	3				
St. Johns, <i>L. W. Fausquette, M. D.</i> .....	33					3	4	4	5	4	5	4	4
Stanton, <i>A. L. Cory, M. D.</i> .....	22							5	4	5	4	5	4
Swartz Creek, <i>G. G. Gordon, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Wacousta, <i>F. A. Jones, M. D.</i> .....	17	5	4	4	4								
Webberville, <i>R. B. Smith, M. D.</i> .....	12	5	4	3									
Webberville, <i>G. W. Langford, M. D.</i> .....	7							3	4				
Wood's Corners, <i>Geo. Pray, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
<b>SOUTHWESTERN DIVISION.</b> .....†	342	34	28	24	26	28	26	30	38	31	33	20	24
Bangor, <i>J. Cump, M. D.</i> .....	51	4	4	4	4	5	4	4	5	4	5	4	4
Benton Harbor, <i>Geo. M. Bell, M. D.</i> .....	7						4	3					
Breedsville, <i>E. P. Robertson, M. D.</i> .....	12							4	4	4			
Niles, <i>Irwin Simpson, M. D.</i> .....	16	5	4	4	3								
Niles, <i>O. P. Horn, M. D.</i> .....	20								4	3	5	4	4
Otsego, <i>Milton Chase, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Paw Paw, <i>J. Andrews</i> .....	25	5	4	4	4	5	3						
Plainwell, <i>B. Thompson, M. D.</i> .....	44	5	4	4	4	5	4	4	5	4	5		
Sangatuck, <i>H. B. Stimson, M. D.</i> .....	10	5	4	4									
Sangatuck, <i>W. W. Mather, M. D.</i> .....	40			3	3	5	3	4	5	4	5	4	4
St. Joseph, <i>R. F. Stratton, M. D.</i> .....	32	5	4		4			3	5	4	3	4	4
South Haven, <i>M. E. Bishop, M. D.</i> .....	33					3	4	4	5	4	5	4	4
<b>SOUTHERN-CENTRAL DIVISION.</b> .....†	970	115	92	88	78	85	68	71	103	73	81	62	54
Adrian, <i>J. Tripp, M. D.</i> .....	20							4	4	4	4	4	4
Albion, <i>A. Crosby, M. D.</i> .....	38	5	4	4	4	5	4	4	5	4	5	4	4
Albion, <i>E. A. Martin, M. D.</i> .....	22								5	4	5	4	4
Ann Arbor, <i>C. George, M. D.</i> .....	12								5	3	4		
Battle Creek, <i>W. J. Fairfield, M. D.</i> .....	13							4	5	4	5	4	4
Brooklyn, <i>E. N. Palmer, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Burr Oak, <i>C. D. Parsons, M. D.</i> .....	16	5	4	4	3								
Coldwater, <i>J. M. Long, M. D.</i> .....	44	5	4			5	4	4	5	4	5	4	4
Coldwater, <i>L. H. Wurtz, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Grass Lake, <i>E. B. Chapin, M. D.</i> .....	17	5	4	4	4								
Hillsdale, <i>Bun Whelan, M. D.*</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Hudson, <i>A. R. Smart, M. D.</i> .....	51	5	4	4	4	5	4	4	5	4	5	4	3
Jackson (Prison), <i>E. L. Kimball, M. D.</i> .....	39	5	4	4	4	5	4	4	5	4			
Jackson (Prison), <i>F. R. Crosby, M. D.</i> .....	9										3	3	3
Jackson, <i>W. Worsfold, M. D.</i> .....	13	5	4	4									
Jerome, <i>A. A. Dunton, Jr., M. D.</i> .....	51	5	4	4	4	5	4	3	5	4	5	4	4
Kalamazoo, <i>J. M. Snook, M. D.</i> .....	13	5	4	4									

\* Health Officer and Correspondent.

† For counties in each division see Exhibit 1, page 59.

## EXHIBIT 42.—CONTINUED.

DIVISIONS AND LOCALITIES REPRESENTED, AND PHYSICIANS WHO REPORTED.	WEEKLY REPORTS IN 1883—COMPILED ON PAGES 201-218.												
(Health Officers in Italics; those also Correspondents marked with a *)	YEAR 1883.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
SOUTHERN-CENTRAL DIV.—Cont'd.													
Kalamazoo, <i>H. H. Schaberg, M. D.</i> .....	25							4		3	5	4	4
Kalamazoo, <i>W. B. Southard, M. D.</i> .....	52	5	4	4	4	5	1	4	5	4	5	4	4
Marshall, <i>J. P. Smiley, M. D.</i> .....	16	5	4	4	3								
Marshall, <i>L. E. Gallup, M. D.</i> .....	47	5	4	4	4	5	4	4	5	4	5	3	
Mendon, <i>C. W. Shepard, M. D.</i> .....	26	5	4	4	4	5	4						
Mendon, <i>H. C. Clapp, M. D.</i> .....	39	5	4	4	4	5	4	4	5	4			
North Adams, <i>W. R. Ditmars, M. D.</i> .....	35	5	4	4	4				5	4	5	4	
Tecumseh, <i>L. G. North, M. D.</i> .....	30	5	4	4	4	5	4	4					
Three Rivers, <i>C. W. Backus, M. D.</i> .....	25	5	4	4	4	5	4						
Union City, <i>R. P. Beebe, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Union City, <i>E. H. Hurd, M. D.</i> .....	35	5	4	4					5	4	5	4	4
Vicksburg, <i>Malcolm Hill, M. D.</i> .....	21				4	5	4	4	4				
Ypsilanti, <i>E. Batwell, M. D.*</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
SOUTHEASTERN DIVISION.....†													
Detroit, <i>W. H. Rouse, M. D.</i> .....	452	40	32	32	32	48	30	36	47	36	47	34	36
Holly, <i>L. E. Wickens, M. D.</i> .....	35					5	4	4	5	4	5	4	4
Memphis, <i>D. H. Cole, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Monroe, <i>J. C. Wood, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Northville, <i>J. M. Swift, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Orion, <i>W. L. Cole, M. D.</i> .....	25	5	4	4	4	5	3						
Pontiac, <i>M. W. Gray, M. D.</i> .....	48	5	4	4	4	5	4	4	5	4	3	3	3
Pontiac, <i>W. McCarroll, M. D.</i> .....	52	5	4	4	4	5	4	4	5	4	5	4	4
Richmond, <i>C. L. Chandler, M. D.</i> .....	33					3	4	4	5	4	5	4	4
Wyandotte, <i>E. P. Christian, M. D.</i> .....	51	5	4	4	4	5	4	4	5	4	5	3	4

\* Health Officer and Correspondent.

† For counties in each division see Exhibit 1, page 59.

## WHAT DISEASES CAUSE MOST SICKNESS?

The answer to the above question for 1883 is given in Exhibit 43, which also affords a comparison of statements for the year 1883 with similar statements for preceding years. Intermitent fever is reported to have caused most sickness in Michigan, in every year. The sickness reported from remittent fever has considerably decreased every year.

Exhibit 44 contains for the six divisions of the State from which sufficient reports were received to be representative, statements as to what disease caused most sickness. The diseases shown to have caused most sickness are placed first in order.

## CLIMATE AND SICKNESS.\*

Exhibit 46 (page 226) is an attempt to learn something of the relations of bronchitis to meteorological conditions, by noting whether each condition was above or below its average for the year, in months when more, and in months when less bronchitis than the average for the year was reported. The months are arranged in order according to the amount of bronchitis reported, those in which most bronchitis was reported being placed first in the column, and those in which more bronchitis than the average was reported being placed above the average line, the others below that line. The conditions for each month are printed, in the proper columns, in the line for the month. The statements being thus arranged, it is easy to see whether the temperature, the velocity of the wind, or any other condition represented, was above its average for the year in months when more than the average amount of bronchitis was reported, and in months when less bronchitis was reported. That the comparisons may the more readily be held in mind, propositions have been made

\*The remarks under this head are applicable, also, by changing the name of the disease to diseases treated in Exhibits 43, 50, 51, 52, and 53, on following pages.

The meteorological data are from places indicated in Exhibit 45, page 224.

concerning the relations of bronchitis to meteorological conditions (stated on page 225), grouping the conditions into two classes. The letters *a* and *b*, in the exhibit, mark exceptions to these propositions. It is not supposed that the propositions are in every case true; but they serve to bring out the evidence of the exhibit on the subject in question. This evidence is to be had by noting the number and force of the exceptions to the propositions, and also whether the exception is explained by facts shown in other columns. A summary of the evidence is presented in Exhibit 60, near the close of this article.

**EXHIBIT 43.**—*Diseases from which there seems to have been the Most Sickness in Michigan in 1883, as indicated by the Per Cent of Weekly Reports Stating Presence of the Diseases, as studied in connection with the Average Order of Prevalence of said Diseases when Reported Present; also, Order, Per Cent of Reports, and Average Order for the same Diseases in 1882, 1881, and 1880.*

1883.					1882.					1881.					1880.				
	ORDER.*	DISEASES IN ORDER OF APPARENT SICKNESS IN 1883, MOST PREVALENT ONE FIRST.	Per Cent of Reports Stating Presence of <i>d</i>	Av. Order of Prevalence when Pres. <i>e</i>	ORDER.*	Per Cent of Reports Stating Presence of <i>d</i>	Av. Order of Prevalence when Pres. <i>e</i>	ORDER.*	Per Cent of Reports Stating Presence of <i>d</i>	Av. Order of Prevalence when Pres. <i>e</i>	ORDER.*	Per Cent of Reports Stating Presence of <i>d</i>	Av. Order of Prevalence when Pres. <i>e</i>						
More sickness than Average for 26 Diseases, in 1883.	1	Intermittent Fever.....	69	2.3	1	71	2.0	1	82	2.4	1	82	2.3						
	2	Neuralgia.....	69	3.3	2	68	3.6	4	65	4.3	5	64	4.5						
	3	Bronchitis.....	66	3.2	3	65	3.3	3	62	3.9	2	64	3.7						
	4	Rheumatism.....	68	3.7	4	68	3.8	2	71	4.6	4	71	4.6						
	5	Consumption, Pulm.....	61	4.5	5	66	4.6	7	71	5.6	8	68	5.7						
	6	Diarrhea.....	49	3.7	7	48	3.8	6	52	3.9	7	47	4.2						
	7	Tonsillitis.....	50	3.9	9	47	3.9	8	48	4.5	9	49	4.4						
	8	Influenza.....	43	3.2	8	40	3.1	9	35	3.5	6	42	3.0						
	9	Remittent Fever.....	41	3.3	6	48	3.3	5	54	3.5	3	56	3.3						
	10	Pneumonia.....	38	4.7	10	39	4.4	10	41	5.4	10	42	5.1						
(11)	Av. of 26 diseases.....	30	4.2	(11)	30	4.2	(11)	33	4.9	(11)	32	4.7							
Less than said Average.	11	Measles.....	24	3.7	21	11	4.9	11	26	4.4	12	19	4.8						
	12	Erysipelas.....	25	5.5	15	22	5.5	17	23	6.2	17	25	6.3						
	13	Dysentery.....	21	5.2	18	17	5.3	15	23	5.1	18	18	5.8						
	14	Typho-mal. Fever.....	18	4.8	12	24	4.9	13	29	5.2	15	24	5.5						
	15	Cholera Morbus.....	18	5.0	17	17	5.2	14	26	5.3	14	20	5.3						

\* Judging from the per cent of reports which stated presence of the diseases, in connection with the order of prevalence when prevalent.

*d* This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from all observers in the State. It combines and states in a general way, an idea of the time a disease was prevalent, with an idea of the area of its prevalence.

*e* The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the Totals of the Order of Prevalence columns, in Table 3 (omitted in this Report), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the order of prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate the large prevalence of the disease, and *vice versa*; but the greater the number of diseases reported present by each observer, from week to week, the greater will be the "average" in this column.



EXHIBIT 41.—In Six (of eleven) Geographical Divisions\* of the State, the Diseases from which there seems to have been the Greatest amount of Sickness in 1883, as indicated by the Per Cent of Weekly Reports Stating Presence of each of 26 Leading Diseases, when Studied in connection with the Average Order of Prevalence of said Diseases when reported present.

	ORDER.†	DISEASES IN ORDER OF APPARENT AMOUNT OF SICKNESS, MOST PREVALENT ONE FIRST.	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence when Pres. e	DISEASES IN ORDER OF APPARENT AMOUNT OF SICKNESS, MOST PREVALENT ONE FIRST.	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence when Pres. e	DISEASES IN ORDER OF APPARENT AMOUNT OF SICKNESS, MOST PREVALENT ONE FIRST.	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence when Pres. e
More sickness than Av. for 26 diseases.		BAY & EAST'N DIV.*			SOUTH-WESTERN DIV.*			SOUTHERN-CEN. DIV.*		
	1	Intermittent Fever.....	78	2.3	Intermittent Fever.....	83	2.3	Intermittent Fever.....	79	2.4
	2	Bronchitis.....	86	3.0	Neuralgia.....	74	3.2	Neuralgia.....	74	3.2
	3	Neuralgia.....	79	3.2	Influenza.....	49	2.9	Bronchitis.....	70	3.2
	4	Rheumatism.....	84	4.0	Rheumatism.....	60	3.8	Rheumatism.....	67	3.8
	5	Consumption, Pul..	77	5.2	Remittent Fever...	46	3.1	Remittent Fever...	56	3.4
	6	Influenza.....	48	3.7	Bronchitis.....	49	3.4	Influenza.....	45	2.8
	7	Tonsillitis.....	61	5.1	Tonsillitis.....	44	3.6	Tonsillitis.....	56	3.8
	8	Diarrhea.....	52	4.5	Diarrhea.....	42	3.7	Diarrhea.....	48	3.5
	9	Measles.....	32	4.3	Measles.....	27	3.0	Consumption, Pul..	62	5.2
	10	Remittent Fever...	35	4.7	Consumption, Pul..	54	5.0	Pneumonia.....	42	4.2
	11	-----	-----	-----	Typhoid Fever.....	8	2.7	Measles.....	21	3.4
	(11)	Av. of 26 diseases.....	36	5.0	-----	-----	-----	-----	-----	-----
	(12)	-----	-----	-----	Av. of 26 diseases.....	27	3.7	Av. of 26 diseases.....	30	4.0
Less.	11	Pneumonia.....	41	6.3	-----	-----	-----	-----	-----	-----
	12	Erysipelas.....	37	6.2	Whooping-cough...	12	2.9	Cholera Morbus....	17	4.1
	13	Typho-mal. Fever...	23	5.7	Pneumonia.....	25	4.4	Dysentery.....	19	4.5
	14	Cholera Infantum...	14	5.5	Cholera Infantum...	16	4.0	Whooping-cough...	15	4.7
More sickness than Av. for 26 diseases.		WESTERN DIVISION.*			CENTRAL DIVISION.*			SOUTH-EASTERN DIV.*		
	1	Intermittent Fever.....	76	2.0	Intermittent Fever.....	65	2.0	Consumption.....	87	4.2
	2	Neuralgia.....	67	3.3	Neuralgia.....	64	2.7	Rheumatism.....	81	4.7
	3	Bronchitis.....	60	3.4	Rheumatism.....	62	3.1	Intermittent Fever.....	71	2.9
	4	Rheumatism.....	67	3.8	Bronchitis.....	57	3.2	Bronchitis.....	72	3.4
	5	Remittent Fever...	51	3.3	Remittent Fever...	35	2.4	Neuralgia.....	66	4.3
	6	Diarrhea.....	53	3.6	Influenza.....	40	2.7	Tonsillitis.....	53	4.2
	7	Tonsillitis.....	54	4.0	Diarrhea.....	37	2.8	Diarrhea.....	53	5.6
	8	Consumption, Pul..	59	4.7	Consumption, Pul..	50	3.4	Pneumonia.....	54	5.9
	9	Influenza.....	40	3.0	Measles.....	20	2.4	Influenza.....	45	5.0
	10	Measles.....	25	3.4	Tonsillitis.....	41	3.4	Remittent Fever...	41	4.8
	11	Pneumonia.....	41	4.3	-----	-----	-----	Diphtheria.....	43	7.2
	(11)	-----	-----	-----	Av. of 26 diseases.....	27	3.2	-----	-----	-----
	(12)	Av. of 26 diseases.....	32	4.2	-----	-----	-----	Av. of 26 diseases.....	40	6.5
Less.	11	-----	-----	-----	Pneumonia.....	30	3.7	-----	-----	-----
	12	Typho-mal. Fev....	27	4.2	Diphtheria.....	15	3.4	Erysipelas.....	45	8.5
	13	Dysentery.....	26	4.4	Typhoid Fever.....	6	3.2	Scarlet Fever.....	38	7.2
	14	Cholera Morbus.....	22	4.1	Dysentery.....	16	3.6	Typho-mal. Fever...	26	4.6

\* For counties in each division see Exhibit 1, page 59.

† Judging from the per cent of reports in connection with the "average order of prevalence where present."

d, e See foot-notes with these marks on pages 207, 222.

EXHIBIT 45.—Names of Stations where were made the Observations of Meteorological Conditions used in Exhibit 46 and following exhibits, relative to Sickness and Meteorological Conditions in 1883; also the Temperature, Humidity, Cloudiness, Ozone, Velocity of Wind, or Atmospheric Pressure, at each Station for which observations of the given condition are included in the summary statement relative to that condition in said exhibits.

STATIONS.*  (Those of U. S. Signal Service in Italics.)	TEMPER- ATURE.		HUMIDITY.		Per Cent of Cloudiness.	OZONE.		Wind, Av. Velocity.	ATMOSPHERIC PRES- SURE.		
	Av Daily Range.	Average.	Relative.	Absolute.		Day.	Night.		Range.		Average.
									Monthly.	Av. Daily.	
Number of Stations in- cluded in Average. }	16	19	18	18	22	20	20	8	16	16	17
Average .....	18.92	43.52	75	3.17	57	3.19	3.47	9.9	.922	.229	29.189
Marquette .....	17.67	38.12	67	2.44	56	2.53	2.99	9.1	1.020	.240	29.267
Escanaba .....	18.31	37.92	74	2.68	52	3.74	3.38	8.8	.999	.240	29.338
Traverse City .....	18.69	41.32	85	3.26	58	2.59	2.84	.....	.972	.236	29.355
Alpena .....	17.06	38.70	75	2.70	58	2.99	4.12	9.5	.993	.241	29.344
Grand Haven .....	14.19	44.70	77	3.25	61	4.03	3.98	11.6	.917	.224	29.350
Reed City .....	.....	41.40	68	2.84	62	3.13	3.61	.....	.888	.229	28.863
Port Austin .....	.....	.....	.....	.....	38	2.91	3.91	.....	.953	.241	29.368
Port Huron .....	16.57	42.70	79	3.16	56	2.48	2.53	9.8	.921	.223	29.304
Thornville .....	17.34	45.78	79	3.52	51	3.02	3.72	.....	.....	.....	.....
Ionia .....	.....	43.81	.....	.....	62	2.47	2.30	.....	.....	.....	.....
Agricultural College .....	20.42	43.52	81	3.34	58	.....	.....	.....	.881	.214	29.094
Lansing .....	19.43	45.69	71	3.20	57	3.36	3.90	11.0	.877	.225	29.039
Winfield .....	24.37	44.43	79	3.43	61	5.17	5.17	.....	.....	.....	.....
Ann Arbor .....	19.73	44.37	76	3.16	56	3.20	3.45	9.8	.873	.222	29.074
Battle Creek .....	.....	.....	.....	.....	57	2.68	2.61	.....	.....	.....	.....
Hillsdale .....	.....	45.25	72	3.25	63	2.99	3.59	.....	.....	.....	28.822
Kalamazoo .....	18.69	45.63	70	3.16	72	3.12	3.48	.....	.....	.....	.....
Marshall .....	19.55	46.77	75	3.47	57	4.27	3.84	.....	.881	.229	29.050
Mendon .....	.....	.....	.....	.....	56	3.29	3.72	.....	.886	.224	29.137
Tecumseh .....	22.90	45.22	80	3.50	53	2.76	3.10	.....	.892	.229	29.144
Detroit .....	16.61	47.73	73	3.44	55	.....	.....	9.7	.898	.224	29.332
Washington .....	21.11	43.87	79	3.31	58	3.15	3.06	.....	.905	.231	29.285

\* At the U. S. Signal Service Stations the observations of mean temperature, humidity, cloudiness, and atmospheric pressure, were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time, which is faster than local time, as follows: At Port Huron, 22 m.; at Detroit, 24 m.; at Alpena, 26 m.; at Grand Haven, 37 m.; at Escanaba, 40 m.; at Marquette, 41 m. At the other stations the observations of these conditions were made at 7 A. M., 2 P., and 9 P. M., local time. Observations of range of temperature were made with registering thermometers read and set at 11 P. M., at the Signal Service Stations; at 7 A. M. at other stations. For the ozone observations the test paper was exposed from 7 A. M. to 2 P. M. for the day observation, and from 9 P. M. to 7 A. M. for the night observation. The velocity of wind was recorded by registering anemometers. These subjects are treated by months in 1883 and for previous years, in an article on Meteorological Conditions in Michigan in 1883, on pages 129-195 of this Report.

Similar exhibits and similar propositions relating to other diseases are given

on following pages. To prevent confusion it has been thought best not to change the statement of the propositions to fit the evidence concerning each disease,—except that they are differently stated for the summer diseases (beginning with the exhibit on diarrhea) and for the winter diseases (beginning with that on bronchitis), a somewhat arbitrary classification of the diseases treated, but one useful for the present purpose.

#### RELATIONS OF BRONCHITIS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.\*—That in months when **more** than the average per cent of weekly reports stated the presence of Bronchitis the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of Bronchitis these conditions were **less** than the average for the year. In Exhibit 46, page 226, the letter *a* marks exceptions to this proposition for the year 1883. As regards ozone, there is, for 1883, no exception to Proposition 1, relating to Bronchitis.

PROPOSITION 2.\*—That in months when **more** than the average per cent of weekly reports stated the presence of Bronchitis, the average daily temperature, and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of Bronchitis these conditions were **greater** than the average for the year. In Exhibit 46, page 226, the letter *b* marks exceptions to this proposition for months in 1883.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 2, it is true also that the quantity of vapor inhaled daily was **less** than the average, and the quantity exhaled daily in excess of that inhaled was **greater** than the average in months when **more** than the average per cent of reports stated presence of Bronchitis; and that **more** vapor was inhaled and a **less** excess exhaled daily in months when the per cent of reports stating presence of Bronchitis was **less** than the average.

EXHIBIT 47.—SICKNESS FROM BRONCHITIS, 1877-83.—*By Year and Months for each of the Seven Years 1877-83. Stating on what Per Cent of the Weekly Reports Received Bronchitis was Reported Present, and Comparing the Per Cents for 1883 with the Averages for Corresponding Months in those Years.*

YEARS, ETC.	An- nual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average, 7 Years 1877-83.....	63	79	79	78	73	62	54	42	41	49	55	68	74
1877.....	55	76	72	72	65	45	31	25	22	37	43	71	77
1878.....	64	77	75	74	71	65	56	41	45	55	60	73	81
1879.....	64	83	87	83	78	65	54	40	41	50	59	65	77
1880.....	64	81	81	82	68	59	57	44	45	46	57	67	72
1881.....	62	86	86	80	78	62	53	38	37	44	44	66	68
1882.....	65	73	70	75	74	70	62	51	44	57	59	71	71
1883 (See Diagram 1, page 200).....	66	77	80	82	76	70	62	56	53	53	57	61	69
In 1883 <b>Greater</b> than Av. 1877-83....	3	----	1	4	3	8	8	14	12	4	2	----	----
In 1883 <b>Less</b> than Av. 7 yrs. 1877-83..	----	2	----	----	----	----	----	----	----	----	----	7	5

\* Explanations are given above; and a summary in Exhibit 60, near the close of this article.



EXHIBIT 46.—BRONCHITIS.—*Stating for the Year and for each Month of the Year 1883, what Per Cent of the Weekly Reports of Diseases Stated Presence of Bronchitis, and what were the Meteorological Conditions, as Observed at Stations in Michigan\* (See Propositions 1, 2, and 3, page 225).*

MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF.†	BRONCHITIS.		TEMPERA- TURE. F.		HUMIDITY of Air.§ Av. of 3 Daily Ob- servations.		VAPOR Inhal'd and Exhaled, from Air Passages, by one Per- son in 24 Hours. (Troy Ozs.)		OZONE,— Relative. Scale of 10°		AV. Velocity of Wind, Miles per Hour, by Anemometer.	ATMOSPHERIC PRESSURE. Inches. Reduced to 32° Fahr.				
	Per Cent of Weekly Re- ports Stating Presence of.	Av. Order of Prevalence where Present.†,‡	Av. Daily Range by Reg- istering Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute—Gra. of Vapor in a Cubic Foot of Air.	Inhaled.	Exhaled in Ex- cess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation 7 A. M. to 2 P. M.		Night Observation. 9 P. M. to 7 A. M.	RANGE.			
													Monthly and for Year.	Av. Daily by 3 Daily Obser- vations. **	Average Pressure.	
More than Av. Per Ct. of Bronchitis.	Mar ..	82	2.8	21.44	24.63	75	1.39	.87	10.81	α 52	3.49	3.87	11.6	1.150	.285	α 29.145
	Feb...	80	2.6	α 18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	.992	.338	29.328
	Jan....	77	2.6	α 17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	1.107	.335	29.221
	Apr...	76	3.1	19.64	43.00	α 67	2.55	1.59	10.09	α 53	3.30	3.65	11.5	α .823	α .180	α 29.125
	May...	70	3.1	20.21	b 51.37	α 70	b 3.44	2.15	9.53	62	3.31	3.81	11.9	α .729	α .200	α 29.099
	Dec...	69	2.6	α 15.13	28.89	80	1.63	1.04	10.64	69	3.25	3.74	12.0	.937	.266	29.205
Average ..	66	3.2	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189	
Less than Av. Per Cl. of Bronchitis.	June..	62	3.7	79.13	64.73	α 77	5.45	3.41	8.27	α 58	3.06	3.12	9.7	.804	.157	29.072
	Nov...	61	2.8	16.34	b 38.10	α 76	b 2.43	1.52	10.16	α 61	2.97	3.22	α 14.4	α 1.072	α .309	29.182
	Oct. . .	57	3.2	15.70	46.73	α 76	3.22	2.01	9.67	α 68	2.87	3.28	9.4	α 1.303	.226	α 29.275
	July..	56	3.9	α 19.06	68.36	α 76	6.02	3.76	7.92	51	2.91	2.80	10.3	.638	.130	29.140
	Aug...	53	4.3	α 22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	.577	.129	α 29.233
	Sept..	53	4.1	α 21.68	57.24	α 75	4.31	2.69	8.99	48	2.65	2.61	8.1	α .929	.193	α 29.238

α An exception to the proposition that **more** than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was **greater** than the average for the year; and **less** in months when the same condition was **less** than the average. See proposition 1, relating to bronchitis, page 225.

b An exception to the proposition that **more** than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was **less** than the average for the year; and **less** in months when the same condition was **greater** than the average for the year. See proposition 2, relating to bronchitis, page 225.

\* How many stations, and what stations, are represented in the statements for each meteorological subject may be seen by referring to Exhibit 45, page 224, in which the stations are named, and a statement for the year 1883, in relation to each meteorological subject, is given for each station included in the average for that subject. In Exhibit 45 is also stated what time the tri-daily observations were made at each station. Additional statements relative to meteorological conditions may be found in an article on the Principal Meteorological Conditions in Michigan in 1883, on pages 123-195 of this Report. Statements relative to the soil moisture and ground water, by months in 1883, are given in Exhibits 4 and 5, and in summary foot-notes on pages 66-68.

† Explanations of statements in these columns, and other statements relative to the prevalence in 1883, of the diseases under consideration, may be found in Tables 2, pp. 206-217, and 4, page 218, of this Report, and also in Diagrams 1, (p. 200) and 2, 3, 4, and 5, on following pages. When the per cent of reports stated for any disease is the same for two months, or for any month is the same as the average the order of months in the first column of these exhibits has been determined by reference to fractional per cents.

‡ The smaller the number in this column, the greater prevalence of the disease is indicated in the localities where it occurred, as compared with other diseases; and *vice versa*, large numbers indicate a less prevalence.

§ Calculated from readings of dry bulb and wet bulb thermometers.

|| Calculated for 18 respirations per minute, of 20 cubic inches of air each. (The numbers in this column are just five-eighths of those in the next preceding column.)

†† Assuming the air exhaled to be saturated with vapor at the temperature of 93° F., in which case each cubic foot of air contains 18.69 grains of vapor, and 18 respirations per minute, of 20 cubic

Proposition 3 would also hold true in relation to pneumonia, membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, and pulmonary consumption, treated in Exhibits 48, 50, 51, 52, and 53, on following pages.

What per cent of the weekly reports received in 1883 stated presence of bronchitis is graphically represented by months in Diagram 1, page 200.

The evidence of Exhibit 46 confirms that of similar exhibits relating to bronchitis in previous years.

What per cent of the reports received stated presence of bronchitis by months in each of the years 1877-83, also the average for those years, and a comparison of 1883 with that average are shown in Exhibit 47, above.

A close relation between bronchitis and temperature is well brought out by a comparison of Exhibit 47, above, stating sickness from bronchitis by months in each of the years 1877-83, with Exhibit 14, page 141, stating the mean temperature by months in the same years. Bronchitis was reported in 1883 on a slightly greater proportion of the reports received than the average for the seven years 1877-83. The mean temperature for 1883 was slightly below the average for those years.

In 1883, in those months in which bronchitis was reported on a greater proportion of reports than the average for the seven years 1877-83, the average temperature was lower than the average of 1877-83.

In November the per cent of reports reporting bronchitis was less than the average for that month in the seven years 1877-83, while for the same month the average temperature was higher than the average in these seven years. In January and December both the average temperature and the sickness reported from bronchitis were below the average for the seven years just named. With the exception of April and November, 1883, in those months when the average temperature was below the average for the seven years 1877-83, the absolute humidity was above, and in those months when the average temperature was below the average for the seven years, the absolute humidity was below. This appears by a comparison of exhibits 14 and 19, pages 141 and 150.

#### RELATIONS OF PNEUMONIA AND OTHER "COLD WEATHER" DISEASES TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.\*—That in months when **more** than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, or pulmonary consumption), the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of the reports stated the presence of pneumonia (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibits 48-53, on page 229, and following pages, the letter *a* marks exceptions to this

inches of air each, make 11.68 Troy ounces of vapor exhaled daily. No correction has been made for expansion of air after it is inhaled.

\* The daily range from which numbers in this column were computed is the difference between the highest and the lowest of the four observations taken during the 24 hours, namely, at 7 A. M., 2 P. M., 9 P. M., of one day, and 7 A. M., of the following day, or at U. S. Signal Stations, at 7 A. M., 3 P. M., 11 P. M., and 7 A. M., Washington mean time, as stated in the \* foot-note on page 142.

\* Explanations of Propositions 1 and 2 are printed on pages 221, 222. A summary statement is printed at the close of this article, in Exhibit 60.

proposition for the year 1883. As regards day and night ozone there is for 1883 no exception to this proposition.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsillitis, influenza, scarlet fever, rheumatism, neuralgia, or pulmonary consumption), the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of pneumonia (or of the other diseases named), these conditions were **greater** than the average for the year. In Exhibits 48-53, on page 229, and following pages, the letter *b* marks exceptions to this proposition for the year 1883.

What per cent of the weekly reports received in 1883 stated presence of pneumonia is graphically represented by months in Diagram 1, page 200. What per cent of the weekly reports received stated presence of pneumonia, and of other diseases mentioned in the two preceding paragraphs, by months in the years 1877-83, is state in Exhibit 49, page 230, where are also given an average for those years and a comparison of 1883 with that average.

Comparing Exhibit 49, page 230, relating to sickness from tonsillitis and neuralgia in the seven years 1877-83, with Exhibit 14, page 141, relating to temperature for the same years, it may be noted that there is a general correspondence (inversely) between the lines stating variations in 1883, from the average temperature for those years, and from the average sickness reported from tonsillitis and neuralgia.

By Exhibit 49 it may be seen that sickness reported from pneumonia was less than the average for corresponding months in preceding seven years in several of the months in 1883, especially in January, February, and December. It is generally true that changes in the rate of sickness from pneumonia occur in the month following the marked change in temperature. The decreased pneumonia in December, 1883, may have been due to the higher than average temperature (and favorable conditions of moisture and ozone coincident with high temperature) in November; but by Exhibit 14, page 141, it may be seen that in January and February the temperature was lower than the average for corresponding months in the same period of seven years 1877-83. And by Exhibit 17, page 132 of the Report of this Board for the year 1883, it may be seen that the temperature in December, 1882, was lower than the average for the six years 1877-82; so that the decreased pneumonia in January and February, 1883, was coincident with and preceded by a low temperature, which has not heretofore appeared to be the case.



EXHIBIT 43.—PNEUMONIA AND MEMBRANOUS CROUP.—*Stating for the Year and for each Month of the Year 1883, what Per Cent of the Weekly Reports of Diseases Stated Presence of Pneumonia, also of Membranous Croup, and what were the Meteorological Conditions, as Observed at Stations in Michigan.\**

PNEUMONIA.																	
MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF.	Per Cent of Weekly Re- ports Stating Presence of.		Av. Order of Prevalence where Present.††	TEMPERA- TURE, F.		HUMIDITY of Air.‡ Av. of 3 Daily Ob- servations.		VAPOR Inhal'd and Exhaled from Air Passages, by one Per- son in 24 Hours, (Troy oz.)		Av. Per Cent of Cloudiness.	OZONE,— Relative, Scale of 10°.		Av. Velocity of Wind, Miles Per Hour, by Anemometer.	ATMOSPHERIC PRESSURE. Inches. Reduced to 32° Fahr.			
	Per Cent of Weekly Re- ports Stating Presence of.	Av. Order of Prevalence where Present.††		Av. Daily Range by Reg- istering Thermometers.	Average of Three Daily Observations.	Relative, Per Cent of Saturation.	Absolute,—Grs. of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Ex- cess of that Inhaled.¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Av. Velocity of Wind, Miles Per Hour, by Anemometer.	Range.		
															Monthly, and for Year.	Av. Daily, by 3 Daily Obser- vations.***	Average Pressure.
More than Av. Per Ct. of Pneumonia.	Mar...	64	4.5	21.44	24.63	75	1.39	.87	10.81	α 52	3.49	3.87	11.6	1.159	.285	α 29.145	
	Feb...	62	4.5	α 18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	.992	.338	29.328	
	Jan...	56	4.5	α 17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	1.107	.335	29.221	
	Apr...	55	4.7	19.64	43.00	α 67	2.55	1.59	10.09	α 53	3.30	3.65	11.5	α .823	α .180	α 29.125	
	May...	46	4.3	20.21	651.37	α 70	b 3.44	2.15	9.53	62	3.31	3.81	11.9	α .729	α .200	α 29.099	
	Dec...	44	4.2	α 15.13	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	.937	.266	29.205	
Average...		38	4.7	18.92	43.52	75	3.17	1.98	9.70	57	c 3.19	c 3.47	11.0	.922	.229	29.189	
Less than Av. Per Ct. of Pneumonia.	Nov...	34	4.7	16.34	638.10	α 76	b 2.43	1.52	10.16	α 61	2.97	3.22	α 14.4	α 1.072	α .309	29.182	
	June...	27	5.2	α 19.13	64.73	α 47	5.45	3.41	8.27	α 58	3.06	3.12	9.7	.804	.157	29.072	
	Oct...	23	4.8	15.70	46.73	α 76	3.22	2.01	9.67	α 68	2.87	3.28	9.4	α 1.303	.226	α 29.275	
	Sept...	21	4.8	α 21.68	57.24	α 75	4.31	2.69	8.99	48	2.65	2.61	8.1	α .929	.198	α 29.238	
	Aug...	16	5.4	α 22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	.577	.129	α 29.233	
	July...	16	5.2	α 19.06	68.36	α 76	6.02	3.76	7.92	51	2.91	2.80	10.3	.638	.130	29.140	
CROUP, MEMBRANOUS,																	
More than Average Per Cent of Mem. Croup.	Feb...	10	6.5	α 18.38	20.03	82	1.29	.81	10.87	63	4.01	4.55	13.1	.992	.338	29.328	
	Jan...	9	6.6	α 17.64	15.48	81	1.71	.69	10.99	69	3.88	4.55	12.2	1.107	.335	29.221	
	Nov...	7	7.8	α 16.34	38.10	76	2.43	1.52	10.16	61	α 2.97	α 3.22	14.4	1.072	.309	α 29.182	
	Apr...	7	7.6	19.64	43.00	α 67	2.55	1.59	10.09	α 53	3.30	3.65	11.5	α .823	α .180	α 29.125	
	Dec...	7	6.9	α 15.44	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	.937	.266	29.205	
	Mar...	6	7.0	21.44	24.63	75	1.39	.87	10.81	α 52	3.49	3.87	11.6	1.159	.285	α 29.145	
	May...	6	5.4	20.21	651.37	α 70	b 3.44	2.15	9.53	62	3.31	3.81	11.9	α .729	α .200	α 29.099	
Average...		6	7.1	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	c 11.0	.922	.229	29.189	
Less than Av. Per Ct. of Mem. Croup.	Sept...	5	8.5	α 21.68	57.24	α 75	4.31	2.69	8.99	48	2.65	2.61	8.1	α .929	.198	α 29.238	
	Oct...	5	7.2	15.70	46.73	α 76	3.22	2.01	9.67	α 68	2.87	3.28	9.4	α 1.303	.226	α 29.275	
	June...	5	6.8	α 19.13	64.73	α 77	5.45	3.41	8.27	α 58	3.06	3.12	9.7	.804	.157	29.072	
	Aug...	4	8.8	α 22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	.577	.129	α 29.233	
	July...	3	8.0	α 19.06	68.36	α 76	6.02	3.76	7.92	51	2.91	2.80	10.3	.638	.130	29.140	

\*. †. ‡. §. ||. ¶. \*\* See foot-notes with these marks in Exhibit 46, page 226.

a Exceptions to Proposition 1, relating to pneumonia or membranous croup, on pages 227-228.

b Exceptions to Proposition 2, relating to pneumonia or membranous croup, on pages 227-228.

c As regards velocity of wind there is, for 1883, no exception to Proposition 1, relating to membranous croup. Statements relating to these diseases for the years 1877-83 are given in Exhibit 49, p. 230.

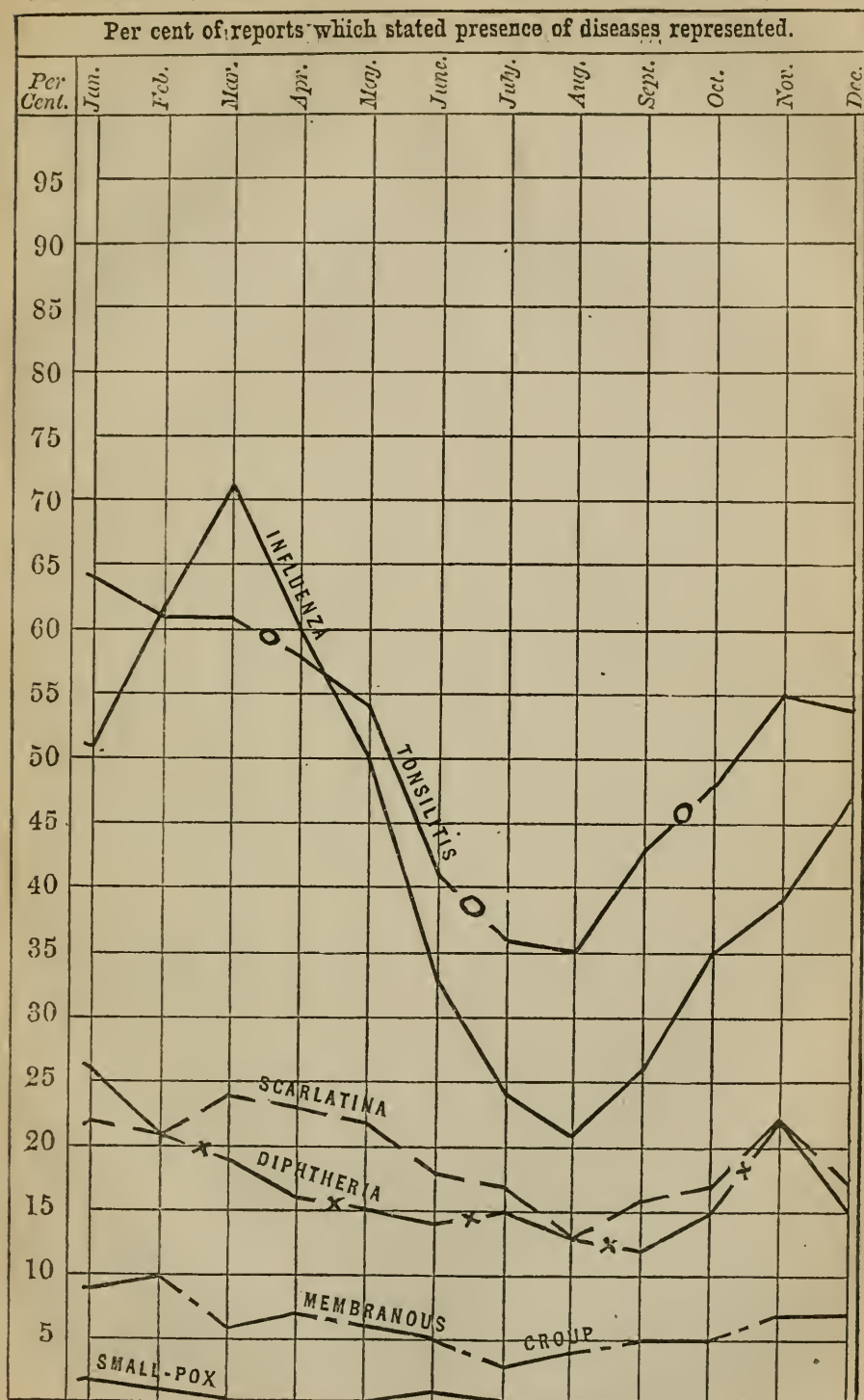
EXHIBIT 49.—*By Year and Months for 1883, 1882, and an Average for the Seven Years 1877-83,\* Stating on what Per Cent of the Weekly Reports received PNEUMONIA, MEMBRANOUS CROUP, DIPHTHERIA, RHEUMATISM, INFLUENZA, SCARLET FEVER,\* TONSILLITIS,\* AND NEURALGIA\* were Reported Present, and Comparing the Per Cents for Months in 1883 with the Averages for Corresponding Months in those Years.†*

YEARS, ETC.																														
PNEUMONIA.	Av. 7 yrs., 1877-83.	40	63	68	65	58	44	28	13	15	19	24	37	49	MEMBRANOUS CROUP.	Year.	7	12	10	9	8	5	4	2	2	4	6	9	11	
	1882.....	39	58	63	60	58	46	34	17	12	19	25	33	47		Jan.	7	10	9	8	7	6	4	3	3	5	9	10	9	
	1883.....	38	56	62	64	55	46	27	16	16	21	23	34	44		Feb.	6	9	10	6	7	6	5	3	4	5	5	7	7	
	In 1883 Greater than Av. 1877-83....	—	—	—	—	—	2	—	—	1	2	—	—	—		Mar.	—	—	—	—	—	—	1	1	1	2	1	—	—	
	In 1883 Less than Av. 7 yrs. 1877-83....	2	7	6	1	—	—	1	2	—	—	—	1	3		5	Apr.	1	3	—	3	1	—	—	—	—	—	—	1	2
DIPHTHERIA.	Av. 7 yrs. 1877-83....	25	33	29	24	23	19	17	17	17	21	30	34	32	RHEUMATISM.	Year.	68	75	73	74	74	70	66	60	55	59	67	72	74	
	1882.....	25	37	32	25	26	22	17	16	14	23	28	28	28		Jan.	68	70	67	70	71	65	69	66	61	62	70	71	74	
	1883.....	17	26	21	19	16	15	14	15	13	12	15	22	15		Feb.	68	77	71	70	80	77	69	64	57	55	62	89	70	
	In 1883 Greater than Av. 1877-83....	—	—	—	—	—	—	—	—	—	—	—	—	1		Mar.	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	In 1883 Less than Av. 7 yrs. 1877-83....	8	7	8	5	7	4	3	2	4	9	15	12	17		Apr.	—	2	—	—	6	7	3	4	2	—	—	—	—	—
INFLUENZA.	Av. 7 yrs. 1877-83....	41	57	63	61	53	39	29	21	21	29	33	42	50	SCARLATINA.	Year.	20	25	26	26	24	21	18	15	13	15	18	20	20	
	1882.....	40	48	51	52	47	40	33	21	19	33	40	44	52		Jan.	18	22	24	23	19	15	22	14	10	12	15	19	18	
	1883.....	43	51	62	71	60	50	33	24	21	26	35	39	47		Feb.	19	22	21	24	23	22	18	17	13	16	17	23	17	
	In 1883 Greater than Av. 1877-83....	2	—	—	10	7	11	4	3	—	—	2	3	3		Mar.	—	—	—	—	—	1	—	2	—	1	—	2	—	—
	In 1883 Less than Av. 7 yrs. 1877-83....	—	6	1	—	—	—	—	—	—	3	—	—	—		Apr.	1	3	5	2	1	—	—	—	—	—	1	—	—	3
TONSILLITIS.*	Av. 5 yrs., 1879-83....	48	61	62	60	53	46	41	31	30	36	44	54	61	NEURALGIA.*	Year.	65	67	69	72	71	65	64	58	56	58	62	67	68	
	1882.....	48	57	59	53	52	47	43	35	31	37	45	54	65		Jan.	63	69	67	69	73	71	69	64	61	64	64	74	72	
	1883.....	50	64	61	61	58	54	41	36	35	43	48	55	54		Feb.	69	77	75	75	78	73	68	64	59	62	64	65	68	
	In 1883 Greater than Av. 1879-83....	2	3	—	1	5	8	—	5	5	7	4	1	—		Mar.	4	10	6	3	7	8	4	6	3	4	2	—	—	—
	In 1883 Less than Av. 5 yrs., 1879-83....	—	—	1	—	—	—	—	—	—	—	—	—	7		Apr.	—	—	—	—	—	—	—	—	—	—	—	—	—	2

\* The average line for tonsillitis and neuralgia includes only the five years 1879-83.

† Other statements for 1883 and months in 1883, relative to these diseases are given in Table 2, pages 206-217, and in Exhibits 48, 50, 51 and 52, pages 229, 232, 233, and 334, where are also given, for convenient comparison, statements of coincident meteorological conditions. The lines for 1883 are graphically represented in Diagrams 1, page 200, 2, page 231, and 4, on a following page.

DIAGRAM 2.—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1883.



Designed by Henry B. Baker.



EXHIBIT 50.--DIPHTHERIA AND TONSILITIS.--*Stating for the Year and for each Month of the Year 1883, what Per Cent of the Weekly Reports of Diseases Stated Presence of Diphtheria, also of Tonsilitis, and what were the Meteorological Conditions, as observed at Stations in Michigan.\**

DIPHTHERIA.				TEMPERA- TURE, F.		HUMIDITY of Air. \$ Av. of 3 Daily Ob- servations.		VAPOR Inhal'd and Exhaled, from Air Passages, by one Per- son in 24 Hours. (Troy Ozs.)		OZONE.— Relative, Scale of 10°.		ATMOSPHERIC PRESSURE. Inches Reduced to 32° Fahr.					
MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF. †	Per Cent of Weekly Re- ports Stating Presence of. †	Av. Order of Prevalence where Present, †, ‡	Av. Daily Range by Reg- istering Thermometers.	Average of Three Daily Observations.	Relative, Per Cent of Saturation.	Absolute,—Grs. of Vapor in a Cubic Foot of Air.	Inhaled,	Exhaled in Ex- cess of that Inhaled, ¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.		Night Observation, 9 P. M. to 7 A. M.		Av. Velocity of Wind, Miles Per Hour, by Anemometer.	RANGE.		
										Monthly and for Year.	Av. Daily by 3 Daily Obser- vations. **	Average Pressure.					
More than Av. Per Cent of Diphtheria.	Jan.	26	4.9	a17.64	15.78	82	1.11	.69	10.99	69	3.83	4.55	12.2	1.107	.335	29.221	
	Nov.	22	5.2	a16.34	38.10	76	2.43	1.52	10.16	61	a 2.97	a 3.22	14.4	1.072	.309	a29.182	
	Feb.	21	5.7	a18.33	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	.992	.338	29.328	
	Mar.	19	5.2	21.44	24.63	75	1.39	.87	10.81	a 52	3.49	3.87	11.6	1.159	.285	a29.145	
	Average....	17	5.4	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189	
Less than Av. Per Cent of Diphtheria.	Apr.	16	5.9	a19.64	b43.00	67	b 2.55	1.59	10.09	53	a 3.30	a 3.65	a 11.5	.823	.180	29.125	
	May.	15	6.2	a20.21	51.37	70	3.44	2.15	9.53	a 62	a 3.31	a 3.81	a 11.9	.929	.200	29.009	
	Dec.	15	5.9	15.13	b26.89	a 80	b 1.66	1.04	10.64	a 69	a 3.25	a 3.74	a 12.0	a .937	a .266	a29.205	
	July.	15	5.2	a19.06	68.36	a 76	6.02	3.76	7.92	51	2.91	2.80	10.3	.638	.130	29.140	
	Oct.	15	4.9	15.70	46.73	a 76	3.22	2.01	9.67	a 68	2.87	3.28	9.4	a1.303	.226	a29.275	
	June	14	4.9	a19.13	64.73	a 77	5.45	3.41	8.27	a 58	3.06	3.12	9.7	.804	.157	29.072	
	Aug.	13	5.0	a22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	.577	.129	a29.233	
	Sept.	12	6.0	a21.68	57.24	a 75	4.31	2.69	8.99	48	2.65	2.61	8.1	a .929	.198	a29.238	
TONSILLITIS.																	
More than Av. Per Cent of Tonsillitis.	Jan.	61	3.3	a17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	1.107	.335	29.221	
	Mar.	61	3.7	21.44	24.63	75	1.39	.87	10.81	a 52	3.49	3.87	11.6	1.159	.285	a29.145	
	Feb.	61	3.6	a18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	.992	.338	29.328	
	Apr.	58	4.1	19.64	43.00	a 67	2.55	1.59	10.09	a 53	3.30	3.65	11.5	a .823	a .180	a29.125	
	Nov.	55	3.5	a16.34	38.10	76	2.43	1.52	10.16	61	a 2.97	a 3.22	14.4	1.072	.309	a29.182	
	May.	54	4.2	20.21	b51.37	a 70	b 3.44	2.15	9.53	62	3.31	3.81	11.9	a .729	a .200	a29.009	
	Dec.	54	3.3	a15.13	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	.937	.266	29.205	
Average ...	50	3.9	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	c 11.0	.922	.229	29.189		
Less than Av. Per Ct. of Tonsillitis.	Oct.	48	3.7	15.70	46.73	a 76	3.22	2.01	9.67	a 68	2.87	3.28	9.4	a1.303	.226	a29.275	
	Sept.	43	4.5	a21.68	57.24	a 75	4.31	2.69	8.99	48	2.65	2.61	8.1	a .929	.198	a29.238	
	June	41	4.2	a19.13	64.73	a 77	5.45	3.41	8.27	a 58	3.06	3.12	9.7	.804	.157	29.072	
	July	36	4.3	a19.06	68.36	a 76	6.02	3.76	7.92	51	2.91	2.80	10.3	.638	.120	29.140	
	Aug.	35	4.5	a22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	.577	.129	a29.233	

\*.†.‡.§.¶. See foot-notes with these marks in Exhibit 46, page 226. a Exceptions to Proposition 1, relating to diphtheria or tonsilitis, on page 45. b Exceptions to Proposition 2, relating to diphtheria or tonsilitis, on pages 227-228. c As regards average velocity of wind, there is, for 1883, no exception to Proposition 2, relating to tonsilitis, pages 227-228. Statements relating to these diseases for the years 1877-83 are given in Exhibit 49, page 230.

EXHIBIT 51.—INFLUENZA AND SCARLET FEVER.—*Stating for the Year and for each Month of the Year 1883, what Per Cent of the Weekly Reports Stated Presence of Influenza, also of Scarlet Fever, and what were the Meteorological Conditions, as observed at Stations in Michigan.\**

INFLUENZA.				TEMPERATURE. F.		HUMIDITY of Air § Av. of 3 Daily Ob- servations.		VAPOR Inhaled and Exhaled, from Air Passages by one Per- son in 24 Hours. (Troy Oz.)		OZONE, — Relative. Scale of 10°.			per Miles		ATMOSPHERIC PRESSURE. Inches. Reduced to 32° Fahr.					
MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF.†				Av. Order of Prevalence where Present, †, ††		Relative, Per Cent of Saturation.		Absolute,—Grains of Vapor in a Cubic Foot of Air.		Av. Per Cent of Cloudiness.			Av. Velocity of Wind, Miles per Hour, by Anemometer.		RANGE.					
More than Av. Per Cent of Influenza.				Av. Daily Range, by Reg- istering Thermometers.		Average of Three Daily Observations.		Inhaled,		Exhaled in Ex- cess of that Inhaled. ¶		Day Observation, 7 A. M. to 2 P. M.			Night Observation, 9 P. M. to 7 A. M.		Monthly and for Year.			
Mar.	71	2.6	21.44	24.63	75	1.39	.87	10.81	a 52	3.49	3.87	12.2	1.159	.285	a 29.145					
Feb.	62	2.3	a 18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	.992	.338	29.328					
Apr.	60	3.0	19.64	43.00	a 67	2.55	1.59	10.09	a 53	3.30	3.65	11.5	a .823	a .180	a 29.125					
Jan.	51	2.6	a 17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	1.107	.335	29.221					
May.	50	3.1	20.21	b 51.37	a 70	b 3.44	2.15	9.53	62	3.31	3.81	11.9	a .729	a .200	a 29.099					
Dec.	47	2.7	a 15.13	26.89	80	1.66	1.04	10.64	65	3.25	3.74	12.0	.937	.266	29.205					
Average..	43	3.2	18.92	43.52	75	3.17	1.98	9.70	57	c 3.19	c 3.47	11.0	.922	.229	29.189					
Less than Av. Per Cent of Influenza.				Nov.		39	2.9	16.34	b 38.10	a 76	b 2.43	1.52	10.16	a 61	2.97	3.22	a 14.4	a 1.072	a .369	29.182
				Oct.		35	3.2	15.70	46.73	a 76	3.22	2.01	9.67	a 68	2.87	3.23	9.4	a 1.303	.226	a 29.275
				June		33	4.0	a 19.13	64.73	a 77	5.45	3.41	8.27	a 58	3.06	3.12	9.7	.804	.157	29.072
				Sept.		26	3.9	a 21.68	57.24	a 75	4.31	2.69	8.99	48	2.65	2.61	8.1	a .929	.198	a 29.238
				July.		24	4.6	a 19.03	68.36	a 76	6.02	3.76	7.92	51	2.91	2.80	10.3	.638	.130	29.140
				Aug.		21	5.1	a 22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	.577	.129	a 29.233
SCARLATINA.																				
More than Av. Per Cent of Scarlatina.				Mar.		24	5.5	21.44	24.63	75	1.39	.87	10.81	a 52	3.49	3.87	11.6	1.159	.285	a 29.145
				Apr.		23	5.6	19.64	43.00	a 67	2.55	1.59	10.09	a 53	3.30	3.65	11.5	a .823	a .180	a 29.125
				May.		22	5.3	20.21	b 51.37	a 70	b 3.44	2.15	9.53	62	3.31	3.81	11.9	a .729	a .200	a 29.099
				Nov.		22	4.2	a 16.34	38.10	76	2.43	1.52	10.16	61	a 2.97	a 3.22	14.4	1.072	.369	a 29.182
				Jan.		22	4.8	a 17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	1.107	.335	29.221
				Feb.		21	5.1	a 18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	.992	.338	29.328
Average..				10		5.2	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189	
Less than Av. Per Cent of Scarlatina.				June		18	5.6	a 19.13	64.73	a 77	5.45	3.41	8.27	a 58	3.06	3.12	9.7	.804	.157	29.072
				July		17	5.8	a 19.06	68.36	a 76	6.02	3.76	7.92	51	2.91	2.80	10.3	.638	.130	29.140
				Dec.		17	5.4	15.13	b 26.89	a 80	b 1.66	1.04	10.64	a 69	a 3.25	a 3.74	a 12.0	a .937	a .266	a 29.205
				Oct.		17	4.9	15.70	46.73	a 76	3.22	2.01	9.67	a 68	2.87	3.28	9.4	1.303	.226	a 29.275
				Sept.		16	5.3	a 21.68	57.24	a 75	4.31	2.69	8.99	48	2.65	2.61	8.1	a .929	.198	a 29.238
				Aug.		13	4.8	a 22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	.577	.129	a 29.233

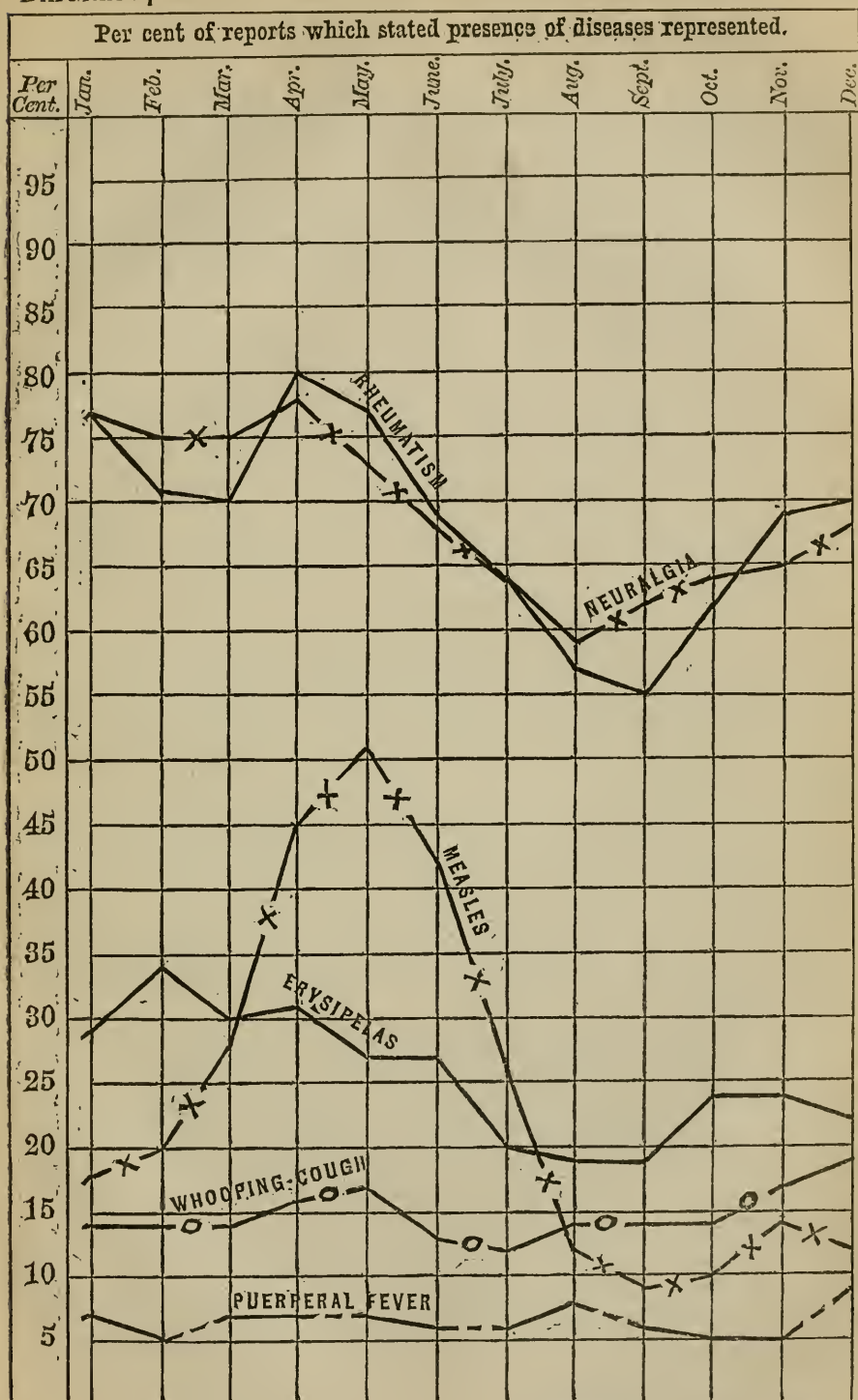
\* †, ‡, §, ||, ¶, \*\*. See foot-notes with these marks in Exhibit 46, page 226. a Exceptions to Proposition 1, relating to influenza or scarlet fever, on pages 227-228. As regards day and night ozone there is, for 1883, no exception to proposition 1, relating to influenza. b Exceptions to Proposition 2, relating to influenza and scarlet fever, on pages 227-228. c As regards day and night ozone, there is, for 1883, no exception to proposition 1, relating to ozone.

EXHIBIT 52.—RHEUMATISM AND NEURALGIA.—*Stating, for the Year and for each Month of the Year 1883, what Per Cent of the Weekly Reports of Diseases Stated Presence of Rheumatism, also of Neuralgia, and what were the Meteorological Conditions, as Observed at Stations in Michigan.\**

		RHEUMATISM.		TEMPERATURE, F.		HUMIDITY of Air, § Av. of 3 Daily Ob- servations.		VAPOR Inhal'd and Exhaled from Air Passages by one Person in 24 Hours. (Troy oz.)		OZONE,— Relative. Scale of 10°.		Per Miles Per Hour, by Anemometer.		ATMOSPHERIC PRESSURE. Inches. Reduced to 32° Fahr.			
		GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF. †								Day Observation, 7 A. M. to 2 P. M.				Night Observation, 9 P. M. to 7 A. M.		Range.	
MONTHS IN ORDER OF		Per Cent of Weekly Re- ports Stating Presence of. †	Av. Order of Prevalence where Present, ‡, ¶	Av. Daily Range, by Reg- istering Thermometers.	Average of Three Daily Observations.	Relative, Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.	Exhaled in Ex- cess of that Inhaled.	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour, by Anemometer.	Monthly and for Year.	Av. Daily, by 3 Daily Obser- vations. **, ††	Average pressure.	
GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF. †																	
More than Average Per Cent of Rheumatism.		Apr..	80	3.9	19.64	43.00	α 67	2.55	1.59	10.00	α 53	3.30	3.65	11.5	α .823	α .180	α 29.125
		Jan..	77	3.7	α 17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	1.107	.335	29.221
		May..	77	3.6	20.21	651.37	α 70	b 3.44	2.15	9.53	62	3.31	3.81	11.9	α .729	α .200	α 29.099
		Feb..	71	3.9	α 18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	.992	.338	29.328
		Mar..	70	4.1	21.44	24.63	75	1.39	.87	10.81	α 52	3.49	3.87	11.6	1.159	.285	α 29.145
		Dec..	70	3.3	615.13	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	.937	.266	29.205
		June	69	3.6	19.13	664.73	77	b 5.45	3.41	8.27	58	α 3.06	α 3.12	α 9.7	α .804	α .157	α 29.072
		Nov..	69	3.3	α 16.34	38.10	76	2.43	1.52	10.16	61	α 2.97	α 3.22	14.4	1.072	.309	α 29.182
Average ..			68	3.7	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189
Less than Av. Pr. Ct. of Rheumatism		July..	64	3.8	19.06	68.36	α 76	6.02	3.76	7.92	51	2.91	2.80	10.3	.638	.130	29.140
		Oct..	62	3.5	15.70	46.73	α 76	3.22	2.01	9.67	α 68	2.87	3.28	9.4	α 1.303	.226	α 29.275
		Aug..	57	4.2	α 22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	.577	.129	α 29.233
		Sept.	55	3.9	α 21.68	57.24	α 75	4.31	2.69	8.99	48	2.65	2.61	8.1	α .929	.198	α 29.238
		</															



DIAGRAM 4—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1883.



Designed by Henry B. Baker.

## RELATIONS OF DIARRHEA TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **less** than the average for the year. In Exhibit 55, page 240, the letter *a* marks exceptions to this proposition for the year 1883.

Explanations of propositions 1 and 2 are given on pages 222 and 225, and a summary of the evidence in Exhibit 55 is given in Exhibit 61, on a following page.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **greater** than the average for the year. In Exhibit 55, page 240, the letter *b* marks exceptions to this proposition for 1883. As regards velocity of wind, there is, for 1883, no exception to Proposition 2 relating to diarrhea.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to proposition 1, it is true also that the quantity of vapor inhaled daily was **greater** than the average, and the quantity exhaled daily in excess of that inhaled was **less** than the average in months when **more** than the average per cent of reports stated presence of diarrhea; and that **less** vapor was inhaled and a **greater** excess exhaled daily in months when the per cent of reports stating presence of diarrhea was **less** than the average.

Proposition 3 is true also in relation to cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, and whooping-cough, treated in Exhibits 55, 57, 58, and 59, page 240, and following pages.

On what per cent of the weekly reports received, by months, in the seven years 1877–83, the eight foregoing diseases were reported present is stated in Exhibit 56, page 241. In Diagram 1, page 200, is graphically represented by months what per cent of the reports in each month in 1883 stated the presence of diarrhea.

The greatest sickness reported from diarrhea in 1883, as has been the rule in former years, was in July, August, September, and October, but in 1883 the sickness reported in those months was less than the average for the seven years 1877–83, as may be seen by Exhibit 56, page 241, while by Exhibit 14, page 141, it may be seen that the average temperature was also lower in those months than the average of the seven years 1877–83. By that Exhibit, it may be seen, however, that the average temperature was lower than usual in other months in 1883, and the question may arise, Why, then, was not the sickness from diarrhea also less in other months? The reply is that heretofore it has been found that there is a corresponding coincidence between diarrhea and high temperature only in those months in which the temperature is above the average annual temperature, while in the coldest months of the year diarrhea has been found to be increased, instead of diminished, by unusually low temperature.

RELATIONS OF CHOLERA INFANTUM AND OTHER "WARM WEATHER" DISEASES  
TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping-cough), the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of cholera infantum (or of the other disease named), these conditions were **less** than the average for the year. In Exhibit 55, page 240, the letter *a* marks exceptions to this proposition for the year 1883.

Explanations of Propositions 1 and 2 are given on pages 222, 225; and a summary of the evidence of Exhibit 55 is given in Exhibit 61, on a following page.

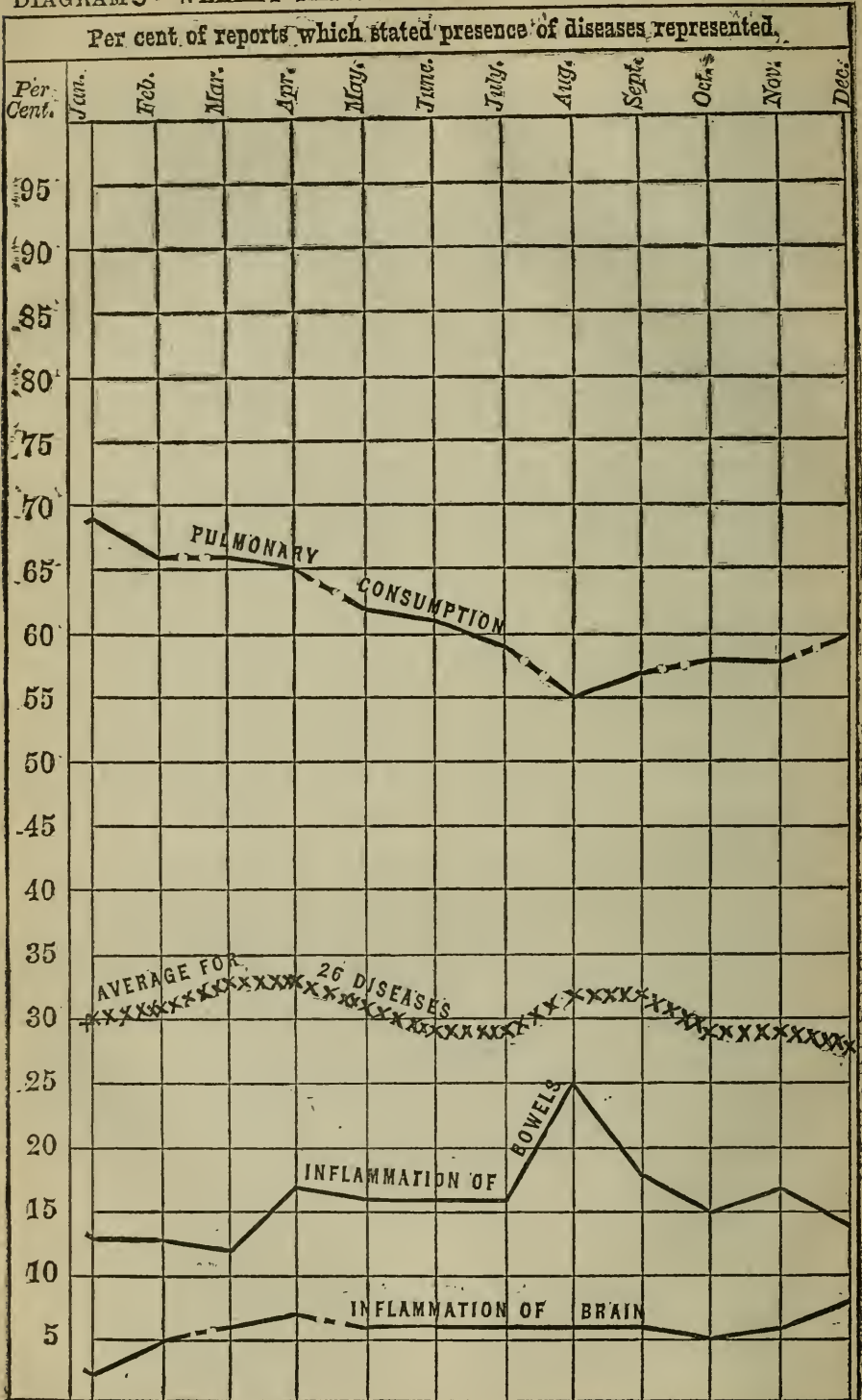
PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles or whooping cough), the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and that in months when **less** than the average per cent of reports stated the presence of cholera infantum (or of the other disease named), these conditions were **greater** than the average for the year. In Exhibit 55, page 240, the letter *b* marks exceptions to this proposition for 1883.

What per cent of all the weekly reports of sickness in each month in 1883 stated presence of cholera infantum is graphically represented by months in Diagram 1, page 200. What per cent of the reports received, by months in the seven years 1877–83, stated presence of cholera infantum, and of the other diseases mentioned in the two preceding paragraphs, Propositions 1 and 2, is stated in Exhibit 56, page 241.

Cholera infantum is most prevalent during the hot months (and the months immediately following those), July, August, September, and October being for 1883, as heretofore, the months in which more than the average sickness from this disease was reported. In 1883, however, the sickness reported from cholera infantum was less in those months than the average for the seven years 1877–83, as may be seen by Exhibit 56. By Exhibit 14, page 141, it may be seen that in those months the temperature was lower in 1883 than the average for 1877–83. But differences in temperature do not seem to have very important relations to cholera infantum except when the temperature is above the average annual temperature; it is not therefore surprising that (as shown by Exhibit 14, page 141, and by Exhibit 56, page 241), the sickness reported from cholera infantum was not lessened by the low temperature in other months in 1883.



DIAGRAM 5—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1893.



Designed by Henry B. Baker.

**EXHIBIT 53.—PULMONARY CONSUMPTION.**—*Stating for the Year and for each Month of the Year, 1883, what Per Cent of the Weekly Reports of Diseases Stated Presence of Pulmonary Consumption, and what were the Meteorological Conditions, as Observed at Stations in Michigan.\**

CONSUMPTION.																	TEMPERATURE, F.		HUMIDITY of Air, § Av. of 3 Daily Observations.		VAPOR Inhaled and Exhaled, from Air Passages by one Person in 24 Hours. (Troy Oze)		OZONE—Relative. Scale of 10°.		ATMOSPHERIC PRESSURE. Inches. Reduced to 32° Fahr.	
MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF.		Per Cent of Weekly Reports Stating Presence of †		Av. Order of Prevalence where Present. ‡		Av. Daily Range, by Registering Thermometers.		Av. of Three Daily Observations.		Relative Per Cent of Saturation.		Absolute—Grs. of Vapor in a Cubic Foot of Air.		Inhaled.    Exh'd in Excess of that Inhaled.		Av. Per Cent of Cloudiness.		Day Observation, 7 A. M. to 2 P. M.		Night Observation, 9 P. M. to 7 A. M.		Av. Velocity of Wind, Miles per Hour, by Anemometer.		RANGE.		
																								Monthly and for Year.	Av. Daily by 3 Daily Observations. **	Average Pressure.
More than Av. Per Ct. of Pul. Consumption.	Jan...	69	4.4	a17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	1.107	.335	29.221										
	Feb...	66	4.8	a18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	.992	.338	29.328										
	Mar...	66	4.8	21.44	24.63	75	1.39	.87	10.81	a 52	3.49	3.87	11.6	1.159	.285	a29.145										
	April.	65	5.0	19.64	43.00	a 67	2.55	1.59	10.09	a 53	3.30	3.65	11.5	a .823	a .180	a29.125										
	May...	62	4.6	20.21	651.37	a 70	b 3.44	2.15	9.53	62	3.31	3.81	11.9	a .729	a .200	a29.099										
	June..	61	4.5	19.13	664.73	77	b 5.45	3.41	8.27	58	a 3.06	a 3.12	a 9.7	a .804	a .157	a29.072										
Average...		61	4.5	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189										
Less than Av. Per Ct. of Pul. Consumption.	Dec...	60	4.4	15.13	b26.89	a 80	b 1.66	1.04	10.64	a 69	a 3.25	a 3.74	a 12.0	a .937	a .266	a29.205										
	July..	59	4.2	a19.06	63.33	a 76	b 6.02	3.76	7.92	51	2.91	2.80	10.3	.638	.130	29.140										
	Nov...	58	4.2	16.34	b38.10	a 76	b 2.43	1.52	10.16	a 61	2.97	3.22	a 14.4	a1.072	a .300	29.182										
	Oct...	58	4.1	15.70	46.73	a 76	3.22	2.01	9.67	a 68	2.87	3.28	9.4	a1.303	.226	a29.275										
	Sept...	57	4.5	a21.63	57.24	a 75	4.31	2.69	8.99	48	2.65	2.61	8.1	a .929	.198	a29.238										
	Aug...	55	4.4	a22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	.577	.129	a29.233										

\*.†.‡.§.||.¶. See foot-notes with these marks in Exhibit 46, page 226.

a Exceptions to proposition 1, relating to pulmonary consumption, on pages 227-228.

b Exceptions to proposition 2, relating to pulmonary consumption, on pages 227-228.

**EXHIBIT 54.—SICKNESS FROM CONSUMPTION, 1878-83.**—*By Year and Months for each of the Five Years 1878-83, Stating on what Per Cent of the Weekly Reports Received CONSUMPTION was Reported Present, and Comparing the Per Cents for 1883 with the Averages for Corresponding Months in those Years.*

YEARS, ETC.	Annual Av.	MONTHS.											
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 6 years 1878-83.....	68	69	70	70	72	69	68	66	63	66	67	67	66
1882.....	66	66	68	66	66	69	66	67	63	63	65	62	65
1883 (See Diagram 5, page 235).....	61	69	66	65	65	62	61	59	55	57	58	58	60
In 1882 Less than Av., 6 yrs., 1878-83.	7	=	4	4	7	7	7	7	8	9	9	9	6

EXHIBIT 55.—DIARRHEA AND CHOLERA INFANTUM.—*Stating for the Year and for each Month of the Year 1883. What Per Cent of the Weekly Reports of Diseases Stated Presence of Diarrhea, also Cholera Infantum, and what were the Meteorological Conditions, as Observed at Stations in Michigan.\**

DIARRHEA.				TEMPERATURE, F.		HUMIDITY, of Air §, Av. of 3 Daily Observations.		VAPOR Inhaled and Exhaled, from Air Passages, by one Person in 24 Hours.		OZONE,—Relative. Scale of 10.°		ATMOSPHERIC PRESSURE. Inches. Reduced to 32° Fahr.				
MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF †	Per Cent of Weekly Reports Stating Presence of †	Av. Order of Prevalence where Present, †, ‡	Av. Daily Range, by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute Grs. of Vapor in a Cubic Foot of Air.	Inhaled.	Exhaled in Excess of that Inhaled. ¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour by Anemometer.	RANGE.			
													Monthly and for Year.	Av. Daily, by 3 Daily Observations. **	Average Pressure.	
More than Av. Per Cent of Diarrhea.	Aug.	82	2.1	22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	a .577	a .129	29.233
	Sept.	77	2.4	21.63	57.24	b 75	4.31	2.69	8.99	48	2.65	2.61	8.1	.929	a .198	29.238
	July.	66	2.8	19.06	68.36	b 76	6.02	3.76	7.92	51	2.91	2.80	10.3	a .638	a .130	a 29.140
	Oct.	51	3.3	a 15.70	46.73	b 76	3.22	2.01	9.67	b 68	2.87	3.28	9.4	1.303	a .226	29.275
	June	49	3.9	19.13	64.73	b 77	5.45	3.41	8.27	b 58	3.06	3.12	9.7	a .804	a .157	a 29.072
	Average..	49	3.7	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	c 11.0	.922	.229	29.189
Less than Av. Per Cent of Diarrhea.	Nov.	41	4.1	16.34	38.10	76	2.43	1.52	10.16	61	b 2.97	b 3.22	14.4	a 1.072	a .309	29.182
	May.	38	4.7	a 20.21	a 51.37	b 70	a 3.44	2.15	9.53	62	3.31	3.81	11.9	.729	.200	29.099
	Apr.	38	5.3	a 19.64	43.00	b 67	2.55	1.50	10.09	b 53	3.30	3.65	11.5	.823	.180	29.125
	Feb.	34	4.7	18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	a .992	a .338	a 29.328
	Mar.	34	4.7	a 21.44	24.63	75	1.39	.87	10.81	b 52	3.49	3.87	11.6	a 1.159	a .235	29.145
	Jan.	31	5.0	17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	a 1.107	a .335	a 29.221
Dec.	30	4.6	15.13	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	a .937	a .266	a 29.205	
CHOLERA INFANTUM.																
More than Av. Per Cent of Cholera Infantum.	Aug.	45	3.7	22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	a .577	a .129	29.233
	Sept.	34	4.3	21.63	57.24	b 75	4.31	2.69	8.99	48	2.65	2.61	8.1	.929	a .198	29.238
	July.	28	4.1	19.06	68.36	b 76	6.02	3.76	7.92	51	2.91	2.80	10.3	a .638	a .130	a 29.140
	Oct.	14	5.5	a 15.70	46.73	b 76	3.22	2.01	9.67	b 68	2.87	3.28	9.4	1.303	.226	29.275
Average..	14	4.8	18.92	.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189	
Less than Av. Per Cent of Cholera Infantum.	June	9	5.8	a 19.13	a 64.73	77	a 5.45	3.41	8.27	58	b 3.06	b 3.12	b 9.7	.804	.157	29.072
	May.	6	6.7	a 20.21	a 51.37	b 70	a 3.44	2.15	9.53	62	3.31	3.81	11.9	.729	.200	29.099
	Apr.	5	6.0	a 19.64	43.00	b 67	2.55	1.50	10.09	b 53	3.30	3.65	11.5	.823	.180	29.125
	Nov.	5	8.7	16.34	38.10	76	2.43	1.52	10.16	61	b 2.97	3.22	14.4	a 1.072	a .309	29.182
	Dec.	3	1.2	15.13	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	a .937	a .266	a 29.205
	Jan.	3	4.3	17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	a 1.107	a .335	a 29.221
	Feb.	3	4.3	18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	a .992	a .338	a 29.328
Mar.	3	5.5	a 21.44	24.63	75	1.39	.87	10.81	b 52	3.49	3.87	11.6	a 1.159	a .235	29.145	

\*.†,‡,§,||,¶,\*\*. See foot-notes with these marks in Exhibit 46, page 226.

Proposition 1, relating to diarrhea or cholera infantum, on page 236, or page 237.

ions to Proposition 2, relating to diarrhea or cholera infantum, on page 236, or page 237.

Statements relative to these Exhibits for the years 1877-83, are given in Exhibit 57, page 242.

c As regards velocity of wind, there is for 1883 no exception to Proposition 2, page 236, relating to diarrhea.

a Exceptions to

b Except-



EXHIBIT 56.—By Year and Months for 1883, 1882, and an Average for the Seven Years 1877-83, Stating on What Per Cent of the Weekly Reports Received DIARRHEA, CHOLERA INFANTUM, INTERMITTENT FEVER, REMITTENT FEVER, TYPHOID FEVER, TYPHO-MALARIAL FEVER, MEASLES, AND WHOOPING-COUGH were Reported Present, and Comparing the Per Cents for 1883 with the Averages for Corresponding Months in those Years.\*

YEARS, ETC.		Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.			Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
DIARRHEA.	Av. 7 yrs., 1877-83.	47	27	27	29	31	35	45	75	87	82	57	35	27	CHOLERA INFANTUM.		13	2	1	2	2	3	10	33	50	37	13	4	1
	1882.....	48	34	31	31	41	39	45	60	78	80	66	40	29			12	1	1	2	1	2	9	17	41	40	20	5	1
	1883.....	49	31	34	34	38	38	49	66	82	77	51	41	30			14	3	3	3	5	6	9	28	45	34	14	5	3
	In 1883 Greater than Av. 1877-83...	2	4	7	5	7	3	4					6	3			1	1	2	1	3	3					1	1	2
	In 1883 Less than Av. 7 yrs. 1877-83...								9	5	5	6											1	5	5	3			
INT. FEVER.	Av. 7 yrs. 1877-83...	78	61	64	68	76	85	86	87	88	88	85	76	67	REMITTENT FEVER.		52	42	41	42	46	51	53	56	64	67	64	53	46
	1882.....	71	59	60	65	68	76	76	77	80	82	80	69	61			48	45	39	38	44	49	44	47	55	61	60	51	42
	1883.....	69	56	62	63	68	74	73	78	77	76	71	62	60			41	36	32	36	41	42	46	43	48	52	45	39	32
	In 1883 Less than Av. 7 yrs. 1877-83...	9	5	2	5	8	11	13	9	11	12	14	14	7			11	6	9	6	5	9	7	13	16	15	19	14	14
TYPHOID FEVER.	Av. 7 yrs. 1877-83...	13	12	10	7	6	6	6	7	14	22	24	22	17	TYPHO-MALARIAL FEVER.		24	19	17	14	12	12	13	17	27	45	48	36	25
	1882.....	14	21	16	12	8	7	9	8	11	17	23	23	16			24	26	23	19	18	15	13	14	21	40	47	37	23
	1883.....	11	11	7	7	7	6	7	6	11	19	21	17	14			18	17	15	13	12	15	14	11	21	32	29	24	15
	In 1883 Greater than Av. 1877-83...					1		1														3	1						
	In 1883 Less than Av. 7 yrs. 1877-83...	2	1	3					1	3	3	3	5	3			6	2	2	1				6	6	13	19	12	10
MEASLES.	Av. 7 yrs., 1877-83...	15	11	14	18	26	31	26	17	9	6	5	7	8	WHOOPING-COUGH.		21	21	21	20	18	20	21	22	22	22	20	22	21
	1882.....	11	10	11	15	13	21	21	17	6	3	4	7	10			17	18	19	20	15	14	15	19	20	20	16	16	13
	1883.....	24	18	20	28	45	51	42	26	12	9	10	14	12			15	14	14	14	16	17	13	12	14	14	14	17	10
	In 1883 Greater than Av. 1877-83...	9	7	6	10	19	20	16	9	3	3	5	7	4															
	In 1883 Less than Av. 7 yrs., 1877-83...																6	7	7	6	2	3	8	10	8	8	6	5	2

\* Other statements for 1883 and months in 1883, relative to these diseases are given in Table 2, pages 206-217, and in Exhibits 53, 57, 58 and 59, pages 240, 242, 243, and 246, where are also given, for convenient comparison, statements of coincident meteorological conditions. The lines for 1883 are graphically represented in Diagrams 1, page 200, 3, page 243, and 4, page 233.

EXHIBIT 57.—INTERMITTENT FEVER AND REMITTENT FEVER.—*Stating for the Year and for each Month of the Year 1883, what Per Cent of the Weekly Reports of Diseases Stated Presence of Intermittent Fever, also of Remittent Fever, and what were the Meteorological Conditions, as observed at Stations in Michigan.\**

INTERMITTENT FEVER.				TEMPERATURE, F.		HUMIDITY of Air, %.		VAPOR Inhaled and Exhaled from Air Passages, by one Person in 24 Hours, (Troy oz.)		OZONE,—Relative, Scale of 10°.			Miles Per Hour, by Anemometer.	ATMOSPHERIC PRESSURE, Inches. Reduced to 32° Fahr.		
MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF.	Per Cent of Weekly Reports Stating Presence of.	Av. Order of Prevalence where Present,††	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative, Per Cent of Saturation.	Absolute,—Grs. of Vapor in a Cubic Foot of Air.	Inhaled,	Exhaled, in Excess of that Inhaled,§	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Range.		Average Pressure.		
												Monthly, and for Year.			Av. Daily, by 3 Daily Observations,‡‡	
More than Av. Per Cent. of Intermittent Fever.	July..	78	1.8	19.06	68.36	b 76	6.02	3.76	7.92	51	2.91	2.80	10.3	a .638	a .130	a29.140
	Aug..	77	2.0	22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	a .577	a .129	a29.233
	Sept..	76	2.0	21.68	57.24	b 75	4.31	2.69	8.99	48	2.65	2.61	8.1	.929	a .198	a29.238
	May..	74	1.9	20.21	51.37	70	3.44	2.15	9.53	b 62	b 3.31	b 3.81	b 11.9	a .729	a .200	a29.099
	June..	73	1.8	19.13	64.73	b 77	5.45	3.41	8.27	b 58	3.06	3.12	9.7	a .804	a .157	a29.072
	Oct...	71	1.9	a15.70	46.73	b 76	3.22	2.01	9.67	b 68	2.87	3.28	9.4	1.303	a .226	a29.275
Average...	69	2.3	18.92	c 43.52	75	c 3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189	
Less than Av. Per Cent. of Intermittent Fever.	Apr...	68	2.6	a19.64	43.00	b 67	2.55	1.59	10.09	b 53	3.30	3.65	11.5	.823	.180	29.125
	Mar..	63	3.0	a21.44	24.63	75	1.39	.87	10.81	b 52	3.49	3.87	11.6	a1.159	a .285	29.145
	Feb..	62	3.1	18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	a .992	a .358	a29.328
	Nov..	62	2.2	16.34	38.10	76	2.43	1.52	10.16	61	b 2.97	b 3.22	14.4	a1.072	a .309	29.182
	Dec...	60	2.6	15.13	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	a .937	a .266	a29.205
	Jan...	56	3.1	17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	a1.107	a .335	a29.221
REMITTENT FEVER.																
More than Average Per Cent. of Remittent Fever.	Sept..	52	3.3	21.68	57.24	b 75	4.31	2.69	8.99	48	2.65	2.61	8.1	.929	a .198	29.238
	Aug..	48	3.2	22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	a .577	a .129	29.233
	June..	46	2.8	19.13	64.73	b 77	5.45	3.41	8.27	b 58	3.06	3.12	9.7	a .804	a .157	a29.072
	Oct...	45	2.7	a15.70	46.73	b 76	3.22	2.01	9.67	b 68	2.87	3.28	9.4	1.303	a .226	29.275
	July..	43	2.9	19.06	68.36	b 76	6.02	3.76	7.92	51	2.91	2.80	10.3	a .638	a .130	a29.140
	May..	42	3.4	20.21	51.37	70	3.44	2.15	9.53	b 62	b 3.31	b 3.81	b 11.9	a .729	a .200	a29.099
Average...	41	3.7	19.64	a43.00	.67	a 2.55	1.59	10.09	53	b 3.30	b 3.65	b 11.5	a .823	a .180	a29.125	
Less than Av. Per Cent. of Remitt. Fev.	Nov...	39	3.2	16.34	38.10	76	2.43	1.52	10.16	61	b 2.97	b 3.22	14.4	a1.072	a .309	29.182
	Jan...	36	3.8	17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	a1.107	a .335	a29.221
	Mar...	36	3.7	a21.44	24.63	75	1.39	.87	10.81	b 52	3.49	3.87	11.6	a1.159	a .285	29.145
	Feb...	32	4.3	18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	a .992	a .358	a29.328
	Dec...	32	3.4	15.13	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	a .937	a .266	a29.205

\* †, ‡, §, ||, ¶, \*\* See foot-notes with these marks in Exhibit 46, page 226.

Proposition 1, relating to intermittent fever or remittent fever, on page 244.

Proposition 2, relating to intermittent fever or remittent fever, on page 241.

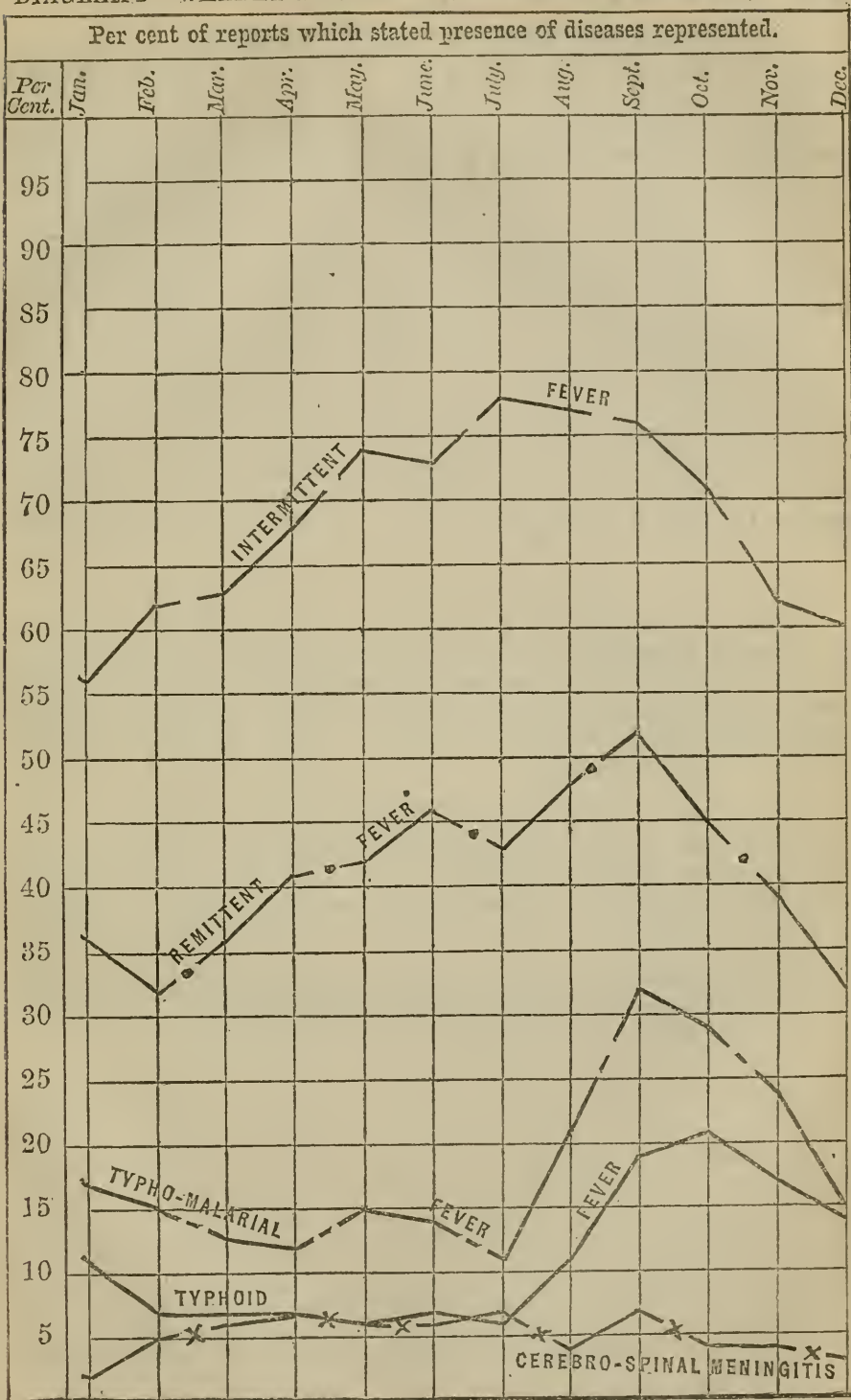
average temperature and absolute humidity, there is, for 1883, no exception to proposition 1, relating to intermittent fever, on page 244. Statements relating to these diseases for the years 1877-83 are given in Exhibit 56, p. 241.

a Exceptions to

b Exceptions to

c As regards

DIAGRAM 3—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1883.



Designed by Henry B. Baker.



## INTERMITTENT AND REMITTENT FEVER.

Exhibit 43 in this and similar exhibits in previous Reports show a gradual decrease in remittent fever since 1878.

Exhibit 56 indicates that in every month intermittent and remittent fever were reported on a less per cent of reports than the average for the corresponding month in the seven years, 1877-83; and Exhibit 14, page 141, shows that the average temperature in each month in 1883, excepting November, was below the average for the corresponding month for the seven years 1877-83.

Without exception in 1883 the months in which more than the average (for the year) of intermittent fever was reported were the months in which the mean temperature was above the average for the year. Without exception they were the months in which the humidity of the atmosphere was greater than the average for the year. With but one exception (May) they were the months in which the average velocity of the wind was less than the average for the year. With but two exceptions (Sept. and Oct.) they were the months in which the monthly range of atmospheric pressure, and with three exceptions (Aug., Sept. and Oct.) the mean atmospheric pressure were less than the average for the year; they were also, without exception, the months in which the mean daily range of atmospheric pressure was less than the average for the year.

## TYPHOID, AND TYPHO-MALARIAL FEVER.

By Exhibit 56, page 241, relating to sickness from typhoid and typho-malarial fevers by months in the years 1877-83, it may be seen that the variations of these diseases in 1883 from the monthly averages for the entire period correspond very closely with each other. A study of the reported sickness from these diseases in connection with coincident weather by months in 1883, is given in Exhibit 58, page 245.

## MEASLES AND WHOOPING-COUGH.

By Exhibit 56, page 241, it appears that on an average for the seven years 1877-83, measles prevailed considerably more in the first half, or in the first seven months, of the year. Also that sickness from measles in months in 1883 was considerably above the average for the corresponding months for seven years, 1877-83.

Exhibit 56 also shows for whooping-cough, on an average for the same seven years, a nearly uniform prevalence in different parts of the year. Both measles and whooping-cough are also treated in Exhibit 59, page 246.

**EXHIBIT 53.—TYPHOID FEVER AND TYPHO-MALARIAL FEVER.**—*Stating, for the Year and for each Month of the Year 1883, what Per Cent of the Weekly Reports of Diseases Stated Presence of Typhoid Fever, also of Typho-Malarial Fever, and what were the Meteorological Conditions, as Observed at Stations in Michigan.\**

TYPHOID FEVER.				TEMPERATURE, F.		HUMIDITY OF AIR. §		VAPOR INHALED and EXHALED from AIR Passages by one Person in 24 Hours. (Troy oz.)		OZONE,—Relative. Scale of 16°.		Per Hour, by Anemometer.	ATMOSPHERIC PRESSURE. Inches. Reduced to 32° Fahr.			
MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS OF TYPHOID FEVER, STATING PRESENCE OF. †	Per Cent of Weekly Reports Stating Presence of. †	Av. Order of Prevalence where Present. ‡	Av. Daily Range, by Registering Thermometers.	Average of Three Daily Observations.	Relative, Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.	Exhaled in Excess of that Inhaled. ¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Av. Velocity of Wind, Miles Per Hour, by Anemometer.	Range.		Average Pressure.
												Monthly and for Year.		Av. Daily, by 3 Daily Observations. **		
More than Av. Pr. Ct. of Typhoid Fever.	Oct. .	21	3.8	α15.70	46.73	b 76	3.22	2.01	9.67	b 68	2.87	3.28	9.4	1.303	α .226	29.275
	Sept. .	19	4.4	α16.63	57.24	b 75	4.31	2.69	8.99	48	2.65	2.61	8.1	.929	α .198	29.238
	Nov. .	17	4.6	α16.34	α38.10	b 76	α 2.43	1.52	10.16	b 61	2.97	3.22	b 14.4	1.072	.309	α29.182
	Dec. .	14	5.5	α15.13	α28.89	b 80	α 1.66	1.04	10.64	b 69	b 3.25	b 3.74	b 12.0	.937	.266	29.205
	Jan. .	11	5.0	α17.64	α15.78	b 82	α 1.11	.69	10.99	b 69	b 3.88	b 4.55	b 12.2	1.107	.335	29.221
	Aug. .	11	5.3	22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	α .577	α .129	29.233
	Average...	21	5.1	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189
Less than Av. Pr. Ct. of Typhoid Fever.	June .	7	5.5	α19.13	α64.73	77	α 5.45	3.41	8.27	58	b 3.06	b 3.12	b 9.7	.804	.157	29.072
	Mar. .	7	6.0	α21.44	24.63	75	1.39	.87	10.81	b 52	3.49	3.87	11.6	α1.159	α .285	29.145
	Feb. .	7	6.4	18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	α .992	α .338	α29.328
	Apr. .	7	6.7	α19.64	43.00	b 67	2.55	1.59	10.09	b 53	3.30	3.65	11.5	.823	.180	29.125
	May. .	6	5.4	α20.21	α51.37	b 70	α 3.44	2.15	9.53	62	3.31	3.81	11.9	.729	.200	29.099
	July. .	6	5.7	α19.06	α68.36	76	α 6.02	3.76	7.92	b 51	b 2.91	b 2.80	b 10.3	.638	.130	29.140
	Average...	18	4.8	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189
TYPHO-MALAR FEVER.																
More than Av. Pr. Ct. Typho-M. F.	Sept. .	32	4.7	21.68	57.24	b 75	4.31	2.69	8.99	48	2.65	2.61	8.1	.929	α .198	29.238
	Oct. .	29	4.4	α15.70	46.73	b 76	3.22	2.01	9.67	b 68	2.87	3.28	9.4	1.303	α .226	29.275
	Nov. .	24	4.8	α16.34	α38.10	b 76	α 2.43	1.52	10.16	b 61	2.97	3.22	b 14.4	1.072	.309	α29.182
	Aug. .	21	4.7	22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	α .577	α .129	29.233
Less than Average Per Cent of Typho-Mal. Fever.	Jan. .	17	4.7	17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	α1.107	α .335	α29.221
	Dec. .	15	4.9	15.13	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	α .937	α .266	α29.205
	May. .	15	5.0	α20.21	α51.37	b 70	α 3.44	2.15	9.53	62	3.31	3.81	11.9	.729	.200	29.099
	Feb. .	15	5.3	18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	α .992	α .338	α29.328
	June .	14	4.5	α19.13	α64.73	77	α 5.45	3.41	8.27	58	b 3.06	b 3.12	b 9.7	.804	.157	29.072
	Mar. .	13	5.9	α21.44	24.63	75	1.39	.87	10.81	b 52	3.49	3.87	11.6	α1.159	α .285	29.145
	Apr. .	12	5.7	α19.64	43.00	b 67	2.55	1.59	10.09	b 53	3.30	3.65	11.5	.823	.180	29.125
	July. .	11	4.3	α19.06	α68.36	76	α 6.02	3.76	7.92	b 51	b 2.91	b 2.80	b 10.3	.638	.130	29.140

\* † ‡ § ¶ \*\* See foot-notes with these marks in Exhibit 46, page 226.  
 † Proposition 1, relating to Typhoid and Typho-malarial fever on page 237.  
 ‡ Proposition 2, relating to Typhoid and Typho Malarial Fever on page 237.

α Exceptions to Proposition 1.  
 b Exceptions to Proposition 2.

EXHIBIT 50.—MEASLES AND WHOOPING-COUGH.—*Stating for the Year and for each Month of the Year 1883. What Per Cent of the Weekly Reports of Diseases Stated Presence of Measles, also of Whooping-Cough, and what were the Meteorological Conditions, as Observed at Stations in Michigan.\**

MEASLES.				TEMPERA- TURE, F.		HUMIDITY, of Air, § Av. of 3 Daily Ob- servations.		VAPOR Inhal'd and Exhaled, from Air Passages, by one Per- son in 24 Hours. (Troy oz.)		OZONE,— Relative. Scale of 10.°		ATMOSPHERIC PRESSURE. Inches. Reduced to 32° Fahr.				
MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF.	Per Cent of Weekly Re- ports Stating Presence of, †	Av. Order of Prevalence where Present, ‡	Av. Daily Range by Reg. Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute Qrs. of Vapor in a Cubic Foot of Air.	Inhaled.	Exhaled in Ex- cess of that Inhaled. ¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour by Anemometer.	RANGE.			
													Monthly and for Year.	Av. Daily, by 3 Daily Obser- vations. **	Average Pressure.	
More than Av. Per Cent of Measles.	May.	51	3.1	20.21	51.37	70	3.44	2.15	a 9.53	b 62	3.31	b 3.81	b 11.9	a .729	a .200	a 29.099
	Apr.	45	3.4	19.64	43.00	67	a 2.55	1.59	10.09	53	3.30	b 3.65	b 11.5	a .823	a .180	a 29.125
	June	42	3.0	19.13	64.73	b 77	5.45	3.41	8.27	b 58	b 3.06	3.12	9.7	a .804	a .157	a 29.072
	Mar.	28	3.9	21.44	a 24.63	b 75	a 1.39	.87	10.81	52	3.49	b 3.87	b 11.6	1.159	.285	a 29.145
	July	26	3.9	19.06	68.36	b 76	6.02	3.76	7.92	51	b 2.91	2.80	10.3	a .638	a .130	a 29.140
	Average..	24	3.7	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189
Less than Av. Per Cent of Measles.	Feb.	20	3.8	18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	a .992	a .338	a 29.328
	Jan..	18	4.3	17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	a 1.107	a .335	a 29.221
	Nov.	14	4.6	16.34	38.10	76	2.43	1.52	10.16	61	b 2.97	b 3.22	14.4	a 1.072	a .300	29.182
	Dec.	12	3.0	15.13	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	a .937	a .266	a 29.205
	Aug.	12	5.0	a 22.65	a 65.41	b 71	a 5.20	3.25	8.43	b 32	b 2.63	b 2.40	b 8.0	.577	.129	a 29.233
	Oct..	10	4.9	15.70	46.73	76	a 3.22	2.01	9.67	68	b 2.87	b 3.28	b 9.4	a 1.303	.226	a 29.275
Sept.	9	5.7	a 21.68	a 57.24	75	a 4.31	2.69	8.99	b 48	b 2.65	b 2.61	b 8.1	a .929	.198	a 29.238	
WHOOPING-COUGH.																
More than Av. Per Cent of Whoop. Cough.	Dec.	19	4.8	a 15.13	a 26.89	b 80	a 1.66	1.04	10.64	b 69	b 3.25	b 3.74	b 12.0	.937	.266	29.205
	May.	17	4.8	20.21	51.37	70	3.44	2.15	9.53	b 62	b 3.31	b 3.81	b 11.9	a .729	a .200	a 29.099
	Nov.	17	5.1	a 16.34	a 38.10	b 76	a 2.43	1.52	10.16	b 61	2.97	3.22	b 14.4	1.072	.309	a 29.182
	Apr..	16	4.9	19.64	43.00	67	a 2.55	1.59	10.09	53	b 3.30	b 3.65	b 11.5	a .823	a .180	a 29.125
Average..	15	5.2	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	29.189	
Less than Av. Per Cent of Whooping-Cough.	Feb.	14	5.1	18.38	20.03	81	1.29	.81	10.87	63	4.01	4.55	13.1	a .992	a .338	a 29.328
	Mar.	14	6.0	a 21.44	24.63	75	1.39	.87	10.81	b 52	3.49	3.87	11.6	a 1.159	a .285	29.145
	Jan..	14	5.2	17.64	15.78	82	1.11	.69	10.99	69	3.88	4.55	12.2	a 1.107	a .335	a 29.221
	Oct..	14	5.7	15.70	46.73	76	a 3.22	2.01	9.67	68	b 2.87	b 3.28	b 9.4	a 1.303	.226	a 29.275
	Aug.	14	5.5	a 22.65	a 65.41	b 71	a 5.20	3.25	8.43	b 32	b 2.63	b 2.40	b 8.0	.577	.129	a 29.233
	Sept.	14	5.7	a 21.68	a 57.24	75	a 4.31	2.69	8.99	b 48	b 2.65	b 2.61	b 8.1	a .929	.198	a 29.238
	June	13	5.6	a 19.13	a 64.73	77	a 5.45	3.41	8.27	58	b 3.06	b 3.12	b 9.7	.804	.157	29.072
July.	12	3.9	a 19.06	a 68.36	76	a 6.02	3.76	7.92	b 51	b 2.91	b 2.80	b 10.3	.638	.130	29.140	

\*†, ‡, §, ¶, \*\* See foot-notes with these marks in Exhibit 46, page 226.

Proposition 1, relating to Measles and Whooping-Cough, on page 237. b Exceptions to Proposition 2, relating to Measles and Whooping-Cough, on page 237.

a Exceptions to



EXHIBIT 60.—*Summary Relative to Propositions contained in Exhibits 46, 48, 50, 51, 52, 53, etc., (pages 226-239) concerning Relations, by Months in 1883, between Greater or Less than usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

DISEASES.	MONTHS (INCLUSIVE) IN WHICH DISEASES NAMED WERE MORE THAN USUALLY PREVALENT IN 1883.	MONTHS (INCLUSIVE) IN WHICH DISEASES NAMED WERE LESS THAN USUALLY PREVALENT IN 1883.	FOR THE 12 MONTHS OF THE YEAR 1883, NUMBER OF MONTHS IN WHICH PROPOSITIONS HOLD TRUE.*										
			That in Months when Diseases named were More Prevalent than usual the conditions named below were Greater than usual, and in Months when Less Prevalent than usual these conditions were less than usual.								That in Months when Diseases named were more Prevalent than usual, the conditions named below were Lower than usual, and in Months when the Diseases were less Prevalent than usual these conditions were Higher than usual.		
			For Av. Daily Range of Temp.	Relative Humidity.	Av. Per Cent of Cloudiness.		Ozone.		Atmospheric Pressure.			Average Temperature.	Absolute Humidity.
			Day.	Night.	Day.	Night.	Day.	Night.	Monthly.	Average Daily.	Average Daily.		
Bronchitis....	Jan. to May, Dec.....	June to Nov....	5	5	7	12	12	11	7	9	6	10	10
Pneumonia....	Jan. to May, Dec.....	June to Nov....	5	5	7	12	12	11	7	9	6	10	10
Mem. Croup..	Jan. to May, Nov., Dec.....	June to Oct.....	4	6	8	11	11	12	8	10	5	11	11
Diphtheria....	Jan. to March, Nov.....	Apr. to Oct., Dec.	3	7	7	8	8	9	9	11	6	10	10
Tonsillitis....	Jan. to May, Nov., Dec.....	June to Oct.....	4	6	8	11	11	12	8	10	5	11	11
Influenza....	Jan. to May, Dec.....	June to Nov....	5	5	7	12	12	11	7	9	6	10	10
Scarlet fever	Jan. to May, Nov.....	June to Oct., Dec.	5	5	7	10	10	11	8	9	4	10	10
Rheumatism..	Jan. to June, Nov., Dec.....	July to Oct.....	6	7	9	10	10	11	7	9	4	10	10
Neuralgia....	Jan. to May....	June to Dec.....	6	4	6	11	11	10	6	8	5	9	9
Consump. Pul.	Jan. to June....	July to Dec.....	7	5	7	10	10	9	5	7	4	8	8

\* The figures in each of these 11 columns show for how many months out of the twelve months in 1883 the proposition named over the column holds true; thus, concerning diarrhea, the proposition relative to Average Daily range of Temperature held true in eight months out of the twelve; that relative to Av. Temperature, in ten out of twelve, etc.

EXHIBIT 61.—*Summary Relative to Propositions contained in Exhibits 55, 57, 58, 59, (pages 240-246), concerning Relation, by Months in 1883, between Greater or Less than Usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

			FOR THE 12 MONTHS OF THE YEAR 1883, NUMBER OF MONTHS IN WHICH PROPOSITIONS HOLD TRUE.*										
DISEASES.	MONTHS (INCLUSIVE) IN WHICH DISEASES NAMED WERE MORE THAN USUALLY PREVALENT IN 1883.	MONTHS (INCLUSIVE) IN WHICH DISEASES NAMED WERE LESS THAN USUALLY PREVALENT IN 1883.	That in Months when Dis- eases named were More Prevalent than Usual the conditions named below were Higher than usual, and in Months when the Dis- eases were Less Prevalent than usual these conditions were Lower than usual.						That in Months when Diseases named were More Prevalent than Usual the conditions named below were less than usual, and in Months when the Dis- eases were Less Prev- alent than usual these conditions were Great- er than usual.				
			Av. Daily Range of Temperature.	Av. Temperature.	Absolute Humidity.	Atmospheric Pressure.			Relative Humidity.	Av. Per Cent of Cloudiness.	Ozone.		Velocity of Wind.
						Monthly.	Av. Daily.	Av. Daily.			Daily.	Night.	
Diarrhea.....	June to Oct...	Jan. to May, Nov., Dec.....	8	11	11	4	2	7	6	8	11	11	12
Cholera Infan...	July to Oct....	Jan. to June, Nov., Dec.....	7	10	10	5	4	8	7	9	10	11	11
Intermit. Fever	May to Oct....	Jan. to April, Nov., Dec.....	9	12	12	3	1	6	7	7	10	10	11
Remit. Fever....	Apr. to Oct....	Jan. to March, Nov., Dec.....	10	11	11	2	0	5	8	8	9	9	10
Typhoid Fever...	Jan., Aug. to Dec.....	Feb. to July....	3	6	6	9	7	10	5	5	8	8	7
Typho-mal. Fev.	Aug. to Nov....	Jan. to July, Dec.....	5	8	8	7	5	8	7	7	10	10	9
Measles.....	March to July	Jan., Feb., Aug. to Dec.....	10	7	7	2	4	1	8	8	6	5	6
Whoop.-cough..	Apr., May, Nov. and Dec.....	Jan. to March, June to Oct....	5	4	4	5	7	4	9	5	4	4	3

\* The figures in each of these 11 columns show for how many months out of the twelve months in 1883 the proposition named over the column holds true; thus, concerning diarrhea, the proposition relative to Average Daily Range of Temperature held true in 8 months out of the twelve; that relative to Average Temperature, eleven months out of twelve, etc.

#### RELATIONS OF TOTAL AMOUNT OF SICKNESS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the 26 diseases tabulated (in tables on pages 203-18) as were reported present, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **less** than the average for the year. In Exhibit 62, page 249, the letter *a* marks exceptions to this proposition for the year 1883.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the 26 diseases tabulated as were reported present, the relative humidity of the atmosphere, the average per cent

of cloudiness, the ozone, and the average velocity of the wind were less than the average for the year; and in months when less than the average per cent of reports stated the presence of said diseases those conditions were greater than the average for the year. In Exhibit 62, page 249, the letter *b* marks exceptions to this proposition for the year 1883.

What per cent of the weekly reports received in 1883 (on an average for such of the tabulated diseases as were reported present) stated presence of the diseases, is graphically represented by months in Diagram 5, page 238.

EXHIBIT 62.—AVERAGE DISEASE.—*Stating for the Year and for each Month of the Year, 1883, what Per Cent of the Weekly Reports of Diseases, on an Average for such of the 26 Tabulated Diseases as were Reported Present, Stated Presence of the Diseases, and what were the Meteorological Conditions, as Observed at Stations in Michigan.\**

DISEASES TABULATED.	MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS OF PRESENCE OF.†		TEMPERA- TURE, F.		HUMIDITY of Air,§ Av. of 3 Daily Ob- servations.		VAPOR Inhal'd and Exhaled, from Air Passages by one Per- son in 24 Hours. (Troy Oz.)		OZONE— Relative. scale of 10°.		per Hour, by Anemometer.	ATMOSPHERIC PRESSURE. Inches. Reduced to 32° Fahr.				
Per Cent of Weekly Re- ports Stating Presence of.†	Av. Order of Prevalence where Present. ††	Av. Daily Range, by Reg- istering Thermometers.	Av. of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute—Grs. of Vapor in a Cubic Foot of Air.	Inhaled.	Exh'd in Ex- cess of that Inhaled ¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour, by Anemometer.	RANGE.				
												Monthly and for Year.	Av. Daily by 3 Daily Obser- vations. **	Average Pressure.		
More than Av. Per Ct. of	Mar...	33	4.4	21.44	a24.63	b 75	a 1.39	.87	10.81	52	b 3.49	b 3.87	b 11.6	1.159	.285	a29.145
	April...	33	4.5	19.64	a43.09	67	a 2.55	1.54	10.09	53	b 3.30	b 3.65	b 11.5	a .823	a .180	a29.125
	Aug...	32	4.1	22.65	65.41	71	5.20	3.25	8.43	32	2.63	2.40	8.0	a .577	a .129	a29.233
	Sept...	32	4.2	21.68	57.24	b 75	4.31	2.69	8.99	48	2.65	2.61	8.1	.929	a .198	a29.238
	May...	31	4.2	20.21	51.37	70	3.44	2.15	9.53	b 62	b 3.31	b 3.81	b 11.9	a .720	a .200	a29.099
	Feb...	31	4.2	a18.38	a20.03	b 81	a 1.29	.81	10.87	b 63	b 4.01	b 4.55	b 13.1	.992	.338	a29.328
	Jan...	30	4.2	a17.64	a15.78	b 82	a 1.11	.69	10.99	b 69	b 3.88	b 4.55	b 12.2	1.107	.335	a29.221
Average...	30	4.2	18.92	43.52	75	3.17	1.98	9.70	57	3.19	3.47	11.0	.922	.229	a29.189	
Less than Av. Per Ct. of.	July...	29	4.1	a19.06	a68.36	76	a 6.02	3.76	7.92	b 51	b 2.91	b 2.80	b 10.3	.638	.130	a29.140
	June...	29	4.2	a19.13	a64.73	77	a 5.45	3.41	8.27	58	b 3.06	b 3.12	b 9.7	.804	.157	a29.072
	Oct...	29	4.0	15.70	a46.73	76	a 3.22	2.01	9.67	68	b 2.87	b 3.28	b 9.4	a1.303	.226	a29.275
	Nov...	29	4.2	16.34	33.10	76	2.43	1.52	10.16	61	b 2.97	b 3.22	14.4	a1.072	a .309	a29.182
	Dec...	28	4.1	15.13	26.89	80	1.66	1.04	10.64	69	3.25	3.74	12.0	a .937	a .266	a29.202

\*.†.‡.||.§.¶. See foot-notes with these marks in Exhibit 46, page 226. It should be noticed that small numbers in the "Av. Order of Prevalence" column in this exhibit indicate less rather than more sickness—reversing the rule stated in note \*, on page 222, with reference to a single disease, or when one disease is compared with another.

a Exceptions to proposition 1, on page 248.

b Exceptions to proposition 2, on page 248.



EXHIBIT C3.—SICKNESS FROM AVERAGE DISEASE, 1877-83.—*By Year and Months for each of the Seven Years 1877-83. Stating on an Average for such of the 26 diseases tabulated as were reported present, What Per Cent of the Weekly Reports Received stated Presence of the Diseases, and Comparing the Average Per Cents for Months in 1883 with the Averages for Corresponding Months in those Years.*

YEARS, ETC.	An- nual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average, 7 Years 1877-83.....	31	31	32	31	31	29	28	30	33	34	32	31	31
1877.....	28	27	28	26	24	24	23	26	29	31	30	30	30
1878.....	30	30	30	31	29	28	26	28	32	35	34	30	32
1879.....	33	35	36	36	35	30	30	32	37	36	34	34	33
1880.....	32	32	32	32	31	30	31	34	36	35	32	30	31
1881.....	33	34	34	32	35	31	30	34	37	36	35	32	31
1882.....	30	31	30	30	30	29	28	28	30	34	32	31	29
1883 (Diagram 5, page 238).....	30	30	31	33	33	31	29	29	32	32	29	29	28
In 1883 <b>Greater</b> than Av. 1877-83.....	-----	-----	-----	2	2	2	1	-----	-----	-----	-----	-----	-----
In 1883 <b>Less</b> than Av. 7 yrs. 1877-83..	1	1	1	-----	-----	-----	-----	1	1	2	3	2	3

# COMMUNICABLE DISEASES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1884.

REPORT BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

This paper continues, for the calendar year 1884, a subject treated for the preceding fiscal year, ending September 30, on pages 79-110 of the Report of the State Board of Health for 1883, and for other fiscal years in preceding annual Reports. Whenever information is received at this office of the outbreak in any locality in Michigan of diphtheria, scarlet-fever, or small-pox, a letter is sent to the health officer of the township, city, or village in which the disease is present (if the name of the health officer has been reported to this office, if not, to the President of the Board of Health), calling his attention (if the report was not received from him) to the existence of the disease within his territory, indicating his duties and powers and proper measures to be taken in restricting the disease, transmitting documents of instruction with regard to prevention and restriction of the disease, for distribution among families especially exposed to it, and asking for a report relative to the prevalence of the disease and the methods employed for and the success in suppressing it. The form of the letter now generally sent, and which is substantially the same as that used during the entire year, is as follows:

MICHIGAN STATE BOARD OF HEALTH, OFFICE OF THE SECRETARY, {  
Lansing, Michigan, \_\_\_\_\_, 188..... }

*Health Officer of:*

DEAR SIR:—I am informed that \_\_\_\_\_ is present in your jurisdiction. By mail I send you one copy of Circular 64, which gives an outline of the duties of the health officer and of the local board of health. I also send you \_\_\_\_\_ copies of the revised document issued by this State Board of Health on the restriction and prevention of this disease. Copies of these documents have been translated into the German and the Holland languages; and translations of a leaflet giving general rules for the prevention of certain communicable diseases have been made into French, Swedish, Polish, and Danish-Norwegian; copies of the leaflet in any or all of these languages will be sent to the health officer for distribution, if he so requests of this office. I trust you will distribute those sent to you where they will do the most good; and it is believed that if distributed to the neighbors of families in which this disease is present the documents will be most likely to be read with interest and profit. It is of the highest importance that prompt, thorough, and persistent measures be employed for the restriction of this disease. Act No. 137, Laws of 1883, requires the health officer to act promptly, even if his board takes no action. (See page 5 of our pamphlet Circular No. 64 on "Work of Health Officers.") Directions for isolation and dis-

infection are given in detail in each copy of the document relating to this disease sent to you. In order to make the measures recommended most effectual, it is necessary to secure, either from the householder, or the physician, prompt notice of each case of this disease. By proper effort it is believed that these notices may be secured under the law as set forth in sections 1734, 1735, 6852, 6853, and 6855 of the Compiled Laws of 1871, and act No. 157 of the Laws of 1879. Sections 1734 and 1735 were modified by act No. 11, Laws of 1883. I trust you and your board of health will do all that is possible to restrict this disease. Your action should be as prompt, efficient, and persistent as is commonly the case with the fire department on the outbreak of a fire. Any aid which this Board may be able to give you will be cheerfully rendered.

After the outbreak is over, I would be pleased to receive from you a final report of this outbreak, which report, in order to be of the greatest use in giving knowledge of the modes of spreading this disease and of the best methods for its restriction and prevention, should be exact and explicit; then abstracts of replies from localities where this disease occurs will, when combined, give valuable knowledge which may be published for general use in the Annual Reports of this Board. This being one object in view, your replies to the questions on the enclosed blank are urgently solicited. The questions to which replies are invited are as follows:

1. What is the disease about which you are reporting?
2. Of what jurisdiction are you an officer, and what is your office?
3. In this outbreak what was the source of the contagium, or how was the disease introduced into your jurisdiction? (In replying to this question, all means by which the contagium of the disease may be retained or carried, such as by letters from infected persons, infected clothing, beard, hair, breath, etc., should receive consideration, as should also the length of time the clothing or goods had been packed away, the direct or indirect exposure to contagium, etc.)
4. What was the date of the first case?
5. What was the date of the last case?
6. How many cases have there been in your jurisdiction in this outbreak?
7. How many deaths have there been from this disease in your jurisdiction in this outbreak?
8. What measures have been taken for the restriction of the disease?
9. What success have you had in restricting the disease?
10. How many cases are there in your jurisdiction at the present time?
11. In case there was a known direct or indirect exposure to a case of this disease, and no other exposure known, what was the time between the exposure and the first appearance of the disease? (The period of incubation is the time between the exposure and the first appearance of the disease as a result of that exposure.) Please state all facts connected with this outbreak which bear on the "period of incubation" of the disease.

A blank form, with a stamped envelope, is enclosed for your final report. Please retain these until the outbreak is over, and then fill out and send the final report to this office.

Please make special weekly reports, on blanks which I send you, so long as the disease lasts.

Very respectfully,

-----, Secretary.

The documents on restriction and prevention of diphtheria, scarlet-fever, and small-pox, and the document on the work of health officers and local boards of health, have been sent to all health officers and members of local boards of health when first published, or when new health officers have been returned. Copies of the appropriate document are sent again on the outbreak of one of these diseases, to make it certain that the health officer shall have them at hand, and that they may be distributed among people especially interested in the disease because of present danger to their own households.

The first distribution of documents on the restriction and prevention of diphtheria, to health officers and members of local boards of health, to correspondents of the Board, physicians, editors, teachers, and other persons interested in the subject was made in October, 1878. These documents (revised) were first sent to local boards of health in localities where the disease was present, in quantities, for distribution among citizens interested, September 30, 1881. With the documents was sent a request for a special report concerning the disease, and the increased distribution of documents tended to increase the number of special reports received.

The distribution of the document on prevention and restriction of *scarlet*



fever, to health officers, correspondents, and others, began in May, 1876. The distribution of the revised document on this subject, to localities where the disease exists, in quantities among persons especially endangered, began in December, 1881.

The distribution of the document relative to the prevention and restriction of *small-pox*, in quantity, began in May, 1882.

In order to facilitate and better systematize the reporting of contagious diseases, the blank form (K)\* for special final report was first sent out from this office November 29, 1882. Also a blank form (L)† for notice of a first out-

\*SPECIAL FINAL REPORT RELATIVE TO A COMMUNICABLE DISEASE.

[K.]

----- P. O., ----- Co., Mich., }  
----- 1883. ----- }

To the Secretary of the Michigan State Board of Health, Lansing, Michigan,

DEAR SIR:

1. The disease about which this report is made is ----- [Name the disease.]
2. The jurisdiction of which I am ----- [Health officer or clerk, etc.], is the ----- [township, city, or village], of ----- [Name of county], County, Michigan.
3. The source of contagium, or the mode of introduction of the disease into my jurisdiction was as follows: ----- [See remarks concerning this question in the letter.]
4. The first case occurred -----, 1883 ----- [Give date of first case.]
5. The last case occurred -----, 1883 ----- [Give date of last case.]
6. In this outbreak there have been ----- [Number] cases in my jurisdiction.
7. From this disease in this outbreak there have been ----- [Number] deaths in my jurisdiction.
8. The measures which have been taken to restrict the spread of the disease are as follows: ----- [Describe the methods employed.]
9. The success attending the efforts at restriction was ----- [Number] cases in my jurisdiction.
10. At the present time there are ----- [Number] cases in my jurisdiction.
11. The following facts bear on the subject of the period of incubation: -----

[Do not fill out and return this until outbreak is over.]

Very respectfully,

----- [Name.]

[Please state whether Health Officer, President, or Clerk.]

Of the Board of Health of -----

[Name of the city, village, or township.]

† REPORT OF OUTBREAK OF A DISEASE DANGEROUS TO THE PUBLIC HEALTH.

[L]

To be mailed to the Secretary of the State Board of Health, Lansing, Michigan, immediately on the occurrence of a first case of small-pox, diphtheria, scarlet fever, cholera, typhus fever, yellow fever, or other disease dangerous to the public health.

To the Secretary of the State Board of Health:

SIR—There has come to my knowledge a case of ----- (Name of disease) in the State of Michigan. The first person sick is ----- (Township, city, or village), County of ----- about ----- (Age) old, who was taken sick with this disease on the ----- day of ----- (Month), 1883. The number of cases which have already occurred is ----- The danger of the spreading of the disease from or into the jurisdiction of other boards of health is ----- (Great, not great, etc.), for the reason that ----- Precautious measures ----- (Will be taken, have been taken, or are suggested to the State Board of Health, as the case may be), as follows: -----

Signature: -----

----- (Whether Health Officer, President, or Clerk).

----- (Date), 1883. -----

----- (Of what township, city, or village).

----- (P. O. address).

[Please fill the blank spaces in this notice if possible, but having learned the name of the disease do not delay sending the report in order to learn other facts provided for in this blank.—H. B. B. Sec. State Board of Health.]

break of a disease, and a blank form (M)† for weekly reports during the continuance of the disease, and a circular (63) explaining use to be made of these blanks, and the need for them, were printed and sent out in May, 1883, to all health officers, or to presidents of boards of health for which no health officer had been returned. Each distribution of these different blanks has been a means of securing more and better special reports; also more complete and valuable information for use in the compilation of this report.

Copies of the documents on restriction and prevention of diphtheria, scarlet fever, and small-pox, in German and in Dutch, were also sent when requested by the health officer or other local officer.

In some instances reports of the presence of contagious diseases in localities reached this office before they reached the local authorities, and outbreaks were restricted to the first case by reason of information immediately sent to them from this office.

The large number of replies received in answer to communications in regard to contagious diseases show a wide-spread interest among the people, and a commendable effort on the part of the local health authorities to have every means employed to prevent the spread of contagious diseases. Some of the letters received, and information contained in other letters, have been compiled and abstracted for this article.

‡ WEEKLY REPORT DURING AN OUTBREAK OF A COMMUNICABLE DISEASE.\*

[M.]

To the Secretary of the State Board of Health, Lansing, Michigan:

SIR,—The following is a report of all known cases of the diseases named below in the ..... [Insert the word township, city, or village.]  
of ..... [Name of jurisdiction,] County of ..... [Name  
of county], State of Michigan, during and at the close of the week ending Saturday, .....  
188..... [Date.]

NAMES OF DISEASES.†	No. sick at last report.	DURING THIS WEEK, NUMBER					No. sick at close of week.	Remarks.
		Moved in.	Taken Sick.	Moved out.	Recovered.	Died.		
Diphtheria.....	.....	.....	.....	.....	.....	.....	.....	.....
Scarlet Fever.....	.....	.....	.....	.....	.....	.....	.....	.....
Small Pox.....	.....	.....	.....	.....	.....	.....	.....	.....
Typhoid Fever.....	.....	.....	.....	.....	.....	.....	.....	.....
†.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....

.....  
[Signature.]

.....  
[Health Officer, or Clerk.]

.....  
[Post office address.]

.....  
[Date of making this report.]

\* The health officer of each township, city, and village in Michigan is respectfully requested to forward a report on this blank to the Secretary of the State Board of Health, Lansing, Michigan, promptly after the close of each week during any portion of which a case of one of the diseases named in this report is present within the jurisdiction of his board.

† Add to this list the name of such a disease as cholera, yellow fever, typhus fever, etc., whenever it occurs.

This is (?) or is not the last blank [M.] I have. Please mark out the superfluous word in the foregoing sentence.

## DIPHTHERIA IN MICHIGAN,—YEAR ENDING DECEMBER 31, 1884.

During the year 1884 there were reported to the office of the State Board of Health 362 outbreaks of diphtheria in 302 localities in Michigan. In these outbreaks there were about 3,915 cases, and about 905 deaths. At or near the time of their occurrence, there were reported (on blanks "L," "K," and "M,") 193 outbreaks in 170 localities, with 2,815 cases, and 668 deaths; this being 569 more cases and 125 more deaths than were reported in the same manner during the fiscal year ending September 30, 1883. Previously, in compiling the contagious diseases, the information used has been that found in the contemporary reports of health officers. The information contained in the annual reports received from clerks and health officers at the close of the year, has herein for the first time been used, for the year ending December 31, 1884.

These reports might seem to indicate that there were more cases of diphtheria during the year 1884 than during the previous year; other sources of information however, more constant and uniform, namely, the weekly reports of the regular correspondents of the State Board of Health, show that there was probably slightly less sickness from diphtheria in 1884, than in 1883. By subtracting from the total cases reported, 3,915, the 2,815 cases reported near the time of their occurrence, it will be seen that during the year ending December 31, 1884, 169 outbreaks of diphtheria in 132 localities, with 1,100 cases and 237 deaths were reported which would not have been counted on the plan of compiling adopted in previous years, because these 169 outbreaks were not reported to this office at the time of their occurrence, as they should have been. For example, in one city (Bay City) there were 15 cases and three deaths not so reported; in another city (Ishpeming) there were 38 cases and 7 deaths; in one village (Fenton) there were 24 cases and 6 deaths; in one township (Sumpter) there were 33 cases and 8 deaths not reported until the close of the year. Whenever mention of an outbreak of any contagious disease has been noticed in any newspaper or by any other method than the usual one of receiving information, instructions have at once been sent to the health officer of the township, city, or village in which the disease is said to be, and documents giving best methods for the restriction and prevention of said disease are sent to be distributed to the neighbors. Perhaps, in some cases the health officers have not lived up to the letter of the law, which requires the health officer to "keep the Secretary of the State Board of Health constantly informed respecting every outbreak of a disease dangerous to the public health;" possibly in more cases physicians have not obeyed the law which requires them to give immediate notice of any disease dangerous to the public health to the health officer, the president, or the clerk of the board of health of the township, city, or village in which the sick person may be; probably in yet more cases the people themselves did not obey the law which requires householders, hotel keepers, etc., who shall know of any case of a disease dangerous to the public health in their household to "immediately give notice thereof to the health officer, the president, or the clerk of the board of health of the township, city, or village in which he resides." But the reports by each of these three classes of persons are increasing in number and accuracy from year to year.

Probably some cases were not reported either at the time of their occurrence or at the close of the year; but, on the other hand, not all cases reported diphtheria were diphtheria, they having been incorrectly diagnosed, so it is possible that the number of cases and deaths reported may be nearly



## DISTRIBUTION OF DIPHTHERIA IN MICHIGAN IN 1884.



correct; and if not exactly correct, the relation of deaths to cases may be correct. According to the reports, the per cent of deaths to cases is found to be 23; the average number of cases to each outbreak was 10.8, and the average number of deaths to each outbreak was 2.5.

As the annual reports received from clerks and health officers do not, in many cases, state the time when the disease occurred, only contemporary reports could be used to learn the proportion of outbreaks in the different seasons of the year. According to such reports, the relative numbers of outbreaks by months were as follows: January 25, February 15, March 11, April 13, May 8, June 11, July 11, August 16, September 18, October 22, November 21, December 21. From this it may be seen that the greatest number of outbreaks (25) had their rise during the month of January, and the smallest number (8) began during the month of May, while during the five months, September, October, November, December, and January, nearly three-fifths of all the outbreaks originated. These figures only exemplify and add new weight to the conclusions, deduced from observations through a series of years, that diphtheria is a cold-weather disease,—most prevalent when catarrhal difficulties most predominate,—the throat being then most susceptible to the diphtheritic cause or poison.

On page 256 will be found a map of the State of Michigan on which are indicated the townships, cities, and villages, in which diphtheria was reported to have occurred in the year 1884; also the number of outbreaks, the number of cases and the number of deaths from this disease in each county of the State; also the railroads in the southern peninsula. This map, and the facts mentioned below, would seem to indicate that this disease is most prevalent along the lines of railroads. The Northern Peninsula is not considered in this connection, because the townships are large, and it is not always known in what part of the township the disease is present. While there were reported in the Southern Peninsula only 98 outbreaks of this disease in 86 localities not on the railroad, there were 266 outbreaks in 216 localities on the railroad, (a township is spoken of as "on the railroad" if any part of it is crossed by any railroad, while some townships are so situated, though the sign (+) on the map representing diphtheria in said township may not touch the line representing the railroad, as several townships have been marked in this way to signify that they contain only a small portion "crossed by the railroad.") There were, in the Southern Peninsula, 475 townships off the railroad, of which 78 reported diphtheria, and 598 townships on the railroad, of which 147 reported diphtheria. Thus, while there were eight-tenths (.8) as many townships not on the railroad as on the railroad, there were only five-tenths (.5) as many townships reporting diphtheria so situated. Not considering the element of population, if the townships on the railroad from which diphtheria was reported bore the same relation to such townships off the railroad that all the townships in Michigan on the railroad bear to the townships not on the railroad, we should have found diphtheria in 50 less townships than the number in which it actually was reported, and 50 is 22 per cent of the whole number of townships in which the disease prevailed. Of the 86 localities not on a railroad, in which diphtheria was reported, 68 joined townships, that were so situated, in many cases the road running along the line dividing the two townships, or just touching the corner of the infected township, leaving only 18 infected districts at a greater distance than six miles from some railroad. In 133 of the 147 townships, a city, village, or station was situated along the line of the railroad. It



may be that more complete returns were made by health officers in these townships, inasmuch as they were more easy of approach, and allowance must be made for the larger population in such townships, furnishing a greater number of susceptible children for the rapid spread of the disease, but after all other elements have been eliminated there is reason to believe that diphtheria is carried from place to place by means of the most usual mode of travel, namely, the railroad.

#### SOURCE OF CONTAGION.

The large cities seem also to have been centers from which diphtheria was spread. For example, outbreaks are reported as brought from Detroit, or caused by exposure to the disease in Detroit, in six townships, as follows: Taylor and Nankin, Wayne Co.; Orion, Oakland Co.; Burchville, St. Clair; Hartford, Van Buren Co.; and Marengo, Calhoun Co. J. C. Flynn, M. D., health officer of Warren township, Macomb Co., reports an outbreak where the patient "came from a house in Detroit where five members of the family had the disease. She did not remain more than an hour." An outbreak was reported in Plymouth township, Wayne Co., where the first case was in Detroit three or four days before coming down. Dr. H. K. Lathrop, health officer of Royal Oak township, Oakland Co., reports an outbreak in "a German family which mingles largely with the German settlement here and in Detroit." Dr. S. D. Holcomb, health officer of Southfield township, Oakland Co., reports as follows: "Four or five days after nursing a child in Detroit which died of diphtheria, a lady returned to this township. A young man worked at her house and slept at home. In a few days his family came down with the disease, and in six days the family of the lady."

Diphtheria prevailed in Spaulding township, Saginaw Co., and was reported as caught in Saginaw. An outbreak occurred in Tittabawassee township, Saginaw Co., where the source of contagium was reported to be "a convalescing patient from Saginaw City." Dr. John P. Corcoran, health officer of the village of Linden, writes as follows: "A boy from East Saginaw not wholly recovered, visited at the house where the first case occurred. Two children from another township in another county, visiting at the house where the Saginaw child stayed, were taken with the disease on reaching their home, and one died." An outbreak of diphtheria occurred in the city of Alpena, concerning which Dr. W. W. Wilson writes as follows: "A young lady from East Saginaw came here while recovering from a severe attack of diphtheria. She played with the children, who were first attacked."

An outbreak with 17 cases and 3 deaths occurred in the township of Bloomington, concerning which Dr. W. B. Hathaway, health officer, writes: "A girl from Kalamazoo, who had the disease two weeks previous and recovered, was visiting at the house where the disease occurred."

One health-officer reports: "The first case came down three and one-half days after attending a public meeting in Pontiac." Another says the disease was "supposed to have been brought from Ann Arbor by a lady who attended the hospital under treatment." Other outbreaks are reported to have been brought from Hillsdale, Flint, Petoskey, "neighboring village," etc. It is, of course, but reasonable to expect that these large cities, which are thus centers of communication in other respects, should be centers of radiation for communicable diseases.

Of the sixty-eight health-officers who made final reports relative to diphthe-



ria, twenty-two reported that the outbreaks could be traced to their source of contagium. Six answered the question as to source of contagium, "sporadic." One health-officer writes: "Children in families half a mile apart came down with the disease at the same time." There seems to be a general consensus of opinion that (whether or not the disease can arise without a specific cause), diphtheria is contagious. All evidence as to the origin of the disease without a specific cause, must necessarily be only negative. A failure to find the source of contagium does not prove that there was no such source. A few health-officers failed to say how the outbreak started, while some gave answers as follows: "Impure water;" "small cellar under the kitchen which was not well ventilated;" "the child, two days before being taken sick, played in the water of a very filthy sewer;" "bad sanitary conditions;" "an old cistern, situated in southwest corner of the house, in a woodshed, whose stagnant and filthy water, together with the rotten boards and timbers for covering, was the direct cause;" "squalid quarters and insufficient food;" "privy vaults in bad condition;" "lowered vitality from want of proper food;" "poverty and filth enough to cause the disease;" "old, damp, filthy house;" "family filthy;" "very filthy place;" "accumulation of filth about the premises;" "bad water and malarial influences;" "poor drainage from well and cistern;" "low situation." One health officer writes: "when the first case was taken sick it was nearly a year since there had been diphtheria here. They had not been from home. A short time previous decaying vegetables had been removed from the cellar." J. F. Young, health-officer of the township of Saugatuck, under date of September 29, writes:

"About ten or twelve days before the boy's illness he was engaged in helping to thresh some wheat that was badly smutted. So offensive and persistent was the odor of the wheat that the atmosphere for some distance was impregnated with its offensive emanations, and the clothes of the boy carried the odor for several days. The boy worked at the tail of the machine where he would receive a large proportion of the dust of the grain. He dated his ill feelings from that time. I cannot of course assign a causal relation between the two events."

Conrad George, M. D., health officer at Ann Arbor, reports concerning an outbreak of diphtheria in the month of October, as follows:

"From all that I have learned I believe that the disease arose from local causes. The house is built on the east slope of a hill and the roof of the rear addition is only two and one-half feet from the ground. The water from the hill and rear roof flows under the house, and a stopped up drain leads back into the cistern, and from thence it flows also under the house. So at the last thaw the back part of the house was in the water, and there was plenty of rotten wood on hand. The bedroom of the family is also in the rear addition, damp and mouldy. The small cellar under the kitchen is cemented and the walls plastered with water lime. This was dry and free from all vegetable refuse. This family had not visited anywhere or received any visitors, and there was no case in that part of the city at the time."

Dr. E. N. Palmer, health officer of Columbia township, Jackson Co., writes:

"The first two cases lived in a house used as a tenement house for fifteen years. The cellar had been used as a catchall and not been cleaned. One week previous to their illness these two persons spent most of one day potting house plants in this cellar. The other cases were in good sanitary condition."

Of those outbreaks where filth, defective sewers, etc., are reported as the source of the contagium, or the cause of the disease, it is not safe to affirm that the sewer, etc., causes the disease. It may simply have carried the cause. There are many other houses with defective drainage and filthy sewers where diphtheria never has occurred.

In many of these outbreaks in which the health officers were unable to trace the first case to the source of contagium, the second and remaining cases could be traced to contagium from the first case. Thus, F. W. Sellars, health

officer of Hume township, gives an account of one epidemic where 21 cases could be traced to the first case. Of this first case, however, no source could be found.

H. H. Schaberg, M. D., health officer of the township of Kalamazoo, reports the outbreak in that township as confined to Holland families, and speaking of the first cases located in a tenement house north of the city, where the father cultivated celery, says:

"They drank water from a ditch (fed by a spring) four inches deep on the average. Just beyond where they dipped up the water the ditch is dammed up for washing celery. The water they drank was daily soiled by washings from the celery. \* \* \* Now whether the disease was contracted by drinking the water or whether they received the infection from some other source I know not, but this is certain to my mind that a number of cases which have broken out in the immediate neighborhood (in the city) may be attributed to the children playing with and attending school with the above mentioned children."

Whether or not human excrement from diphtheritic patients was used to manure the celery cannot, probably, be ascertained.

H. B. Hemenway, M. D., health officer of Kalamazoo City, writes of the outbreak in that city as follows: "In my opinion the disease was not brought to Kalamazoo, but originated here. The first cases were isolated ones and occurred in remote parts of the city. Filth is to be found abundantly around all their houses." The clerk of the city of Kalamazoo writes concerning this outbreak that many were disposed to think that the mass of refuse left on the celery grounds in the city was a predisposing cause, but which he thought no worse than the wild vegetation that formerly flourished in the same locality. He states that "the disease had practically no hold where the Holly water had been used."

#### OUTBREAKS TRACED TO THEIR PROBABLE SOURCES.

Dr. C. W. Marvin, health officer of Ithaca township, reports: "The mother and daughter had been visiting at a house 50 rods from which diphtheria prevailed. The girl called at this house; returning home the daughter had sore throat which the physician called simply fever, though she said that she spit up chunks streaked with blood. The rest of the family had diphtheria."

An outbreak occurred in the township of Cooper, Kalamazoo Co., concerning which the health officer reports: "A servant girl introduced the disease who claims to have contracted it by washing clothing worn by a diphtheritic patient."

An outbreak in Brighton, Livingston Co., originated in the following manner: "A lady friend who recently had diphtheria visited the family. In two weeks after said visit five of the children were taken sick."

Geo. E. Roys, health officer of the township of Florence, writes of an outbreak in that township: "The patient was exposed while visiting with persons near Constantine, who were not known to have the disease at the time, but who started to Kansas that day, and reported that one of their children had died of diphtheria on the journey."

In an outbreak in the village and township of Milford, the contagion was reported by the health officer to have been carried "by a servant in the family whose mother brought clothing from a school building in New York city, supposed to be infected. The cases occurred in her family immediately after the clothing was received." In this outbreak there were 22 cases and 5 deaths.

H. B. Hemenway, M. D., health officer of the city of Kalamazoo, under date of Nov. 13, 1885, writes concerning a young lady who was reading before a grate fire:

"Suddenly taken with an epileptic seizure she fell forward into the fire. One ear was burned off. Her lips and tongue were badly burned. On her forehead a portion of the flesh was burned to the bone. There was another deep scar over the scapula. The flesh was burned off from the back of one hand. She seemed to be getting along about as well as could be expected until the first day of November. That day the surgeon noticed what he afterwards was able to recognize as a diphtheritic membrane over one eye. The same day the young lady spoke of her throat being sore. The surgeon supposed that she had simply caught cold. The membrane spread over much of the surface of the facial wound. Her throat was very bad. Death came to her sufferings November 9. One of the surgeons in attendance was at the same time treating a case of diphtheria that proved fatal November 8."

Dr. J. E. Scallon, health-officer of the township of Hancock, Houghton Co., reported concerning an outbreak of diphtheria in the months of November and December as follows:

"The father traded in a store in Franklin township where the disease prevailed, and where the health-officer claimed it was not contagious. The first case occurred November 26; the other children were removed from the house and returned to it eight or ten days after the child had been buried and the house fumigated. The physician who attended this patient attended a woman in another house where children were attacked. One of the children that returned took the disease five days after returning, and died in three days. The family was removed to Marquette city ninety miles away, and another child had it there about a week after removal."

Dr. M. E. Bishop, health-officer of the village of South Haven, writes: "The father of the child (a commercial traveler) had the disease in a mild form. Thus a case of diphtheria, so mild as to escape notice, may prove contagious, as in this case."

John S. Caulkins, M. D., health-officer of the township of Dryden, writes as follows concerning an outbreak in the township of Attica during the month of January: "The patient attended a church social on Tuesday evening and was taken sick Thursday evening. There were people at the social who had been at Arcadia," where the disease then prevailed. L. E. Ellis, M. D., health-officer of Springwells, reports concerning an outbreak of 27 cases and 7 deaths, that the outbreak was brought in by a "German girl coming direct from Germany; she said that two died on the ship with sore throat, but it was not given any name that she knew of." In his annual report he mentions these and other cases which occurred later as "imported from the city, as near as I can trace them."

#### HOW LONG WILL THE CONTAGIUM REMAIN ACTIVE?

One health-officer reports an outbreak where "about two weeks previous a person, whose family had diphtheria several months ago, stayed all night at this house." Dr. M. V. B. McKinney, health-officer of the village of Lawton, reports concerning an outbreak in the month of August: "A lad who had diphtheria in April last came to live with the family in which the outbreak occurred." A. S. Martin, M. D., health-officer of Texas township, Kalamazoo county, reports of an outbreak in the month of February: "The child was visiting a week or ten days before coming down, at a house in Portage where they had diphtheria last September." If this was the source, it makes the diphtheriic germ five months old. One health-officer reports concerning an outbreak in the month of August, as follows: "The contagium is supposed to have been carried by a man who lost a wife with the disease the previous winter, and who now lived across the road from the first case." One outbreak was reported where the germ was supposed to have lain dormant nearly three years. Concerning this outbreak, W. H. Smith, M. D., health-officer of the city of St. Clair, writes under date of February 13, 1884, substantially as follows:

In 1881 a little girl living in this house was attacked with diphtheria which terminated fatally in a few days. About one year ago the family moved out of this house, which remained tenantless



until about four months ago. During the last week three of the six children in the family, that lately moved in, were taken with diphtheria; one case terminated fatally within two days. The family assert positively that they have not been away from home. The disease has not previously existed in this city or adjacent country for more than a year. With the exception of this family there are at present no cases in this vicinity. The furniture had been completely changed by the moving out of one family and the moving in of the other. The paper on the walls remained the same, being torn in strips in some places. The facts in the case are compatible with the supposition that germs of the disease lie dormant in the building and only develop into activity when new victims and appropriate climatic conditions are presented.

Other outbreaks are reported as follows: "The lady had not been away from home in one or two months. Two years ago there was a death from diphtheria in the same house." "Child in the same family died of diphtheria little over a year before." "The patient was of dissipated habits and may have visited a house where there was a violent outbreak three or four years before."

Dr. J. C. Flynn, health officer of the township of Warren, reports an outbreak where one person took the disease by sleeping in a room occupied by a diphtheritic patient six weeks previously.

#### MEASURES TAKEN TO RESTRICT DIPHTHERIA.

Of the sixty-eight health officers who made special final reports, eighteen reported that they had used the sulphur method of disinfection in houses where outbreaks of diphtheria had occurred, while twenty-three reported that the houses had been disinfected as the law required, or "according to the rules laid down by the State Board of Health," or made similar answers which would lead me to think that fumigation by burning sulphur was the disinfectant used in these cases. All these health officers reported that their efforts at disinfection were successful except one, Dr. W. P. Gamber, health officer of the village of McBride, who said: "The success attending our efforts was seemingly not very good, and yet no doubt would have been much worse without the measures that were taken." There were thirteen cases in this outbreak.

Dr. M. S. Dowling, health officer of the village of Leslie, reported an outbreak where the efforts at restriction were not successful, and, at first sight, the disinfection might seem to have been very unsuccessful. Under date of April 17, 1884, he writes: "Some three weeks ago a case of diphtheria made its appearance in this village. There had been no other cases here since last fall. The patient, a girl, died after an illness of a week or so. After the death of the child the house, etc., was disinfected, the walls repapered, the rooms overhead were whitewashed or calcimined, and every effort made to render the premises free from disease germs. However, nearly a week ago the three remaining children of this family took the disease, and at the present time are dangerously ill." In this case the remaining children may have caught the disease before the death of the first child, as this would have made the period of incubation about one week, which, as will be seen on page 266, is not a longer period than is often found.

Many of the outbreaks reported were limited to one case or to one family. One reported that the outbreak was "confined to the three buildings where it first appeared." Some reported that the outbreak ceased as soon as precautionary measures were taken.

Dr. T. Allen Cullis, health officer of the village of Vassar, reported that in several families some members did not have the disease, which was due, in his opinion, to the isolation of patients and thorough disinfection of premises. In this outbreak only six cases occurred after the use of sulphurous acid gas as a disinfectant, although previous to its use the disease had become widespread in the place. D. E. Robinson, M. D., health officer of the city of

Manistee, under date of May 25, 1885, reports that he had in every case (during the years 1883 and 1884) used sulphur as a disinfectant, tightly closing the room in which the patient had been sick, and burning as much sulphur as possible in the room. "The bedding and clothing were first subjected to the fumes." "In every outbreak during those two years the disease was confined to the family in which it was first discovered; and where isolation with intelligent co-operation could be secured, it did not extend to other members of the family, although there were in several instances other children in the family. Furthermore, no subsequent case could be traced to one of these houses in which diphtheria had previously existed, in all of which sulphur was used as a disinfectant."

Dr. A. J. Abbott, health officer of the village of Emmett, writes concerning an outbreak of diphtheria in his jurisdiction during the month of December: "A matter I deem of great import is the prohibition of burning sulphur in the houses *during* a diphtheria epidemic. I find the practice quite general and very pernicious. In one case the man, 38 years old, burned sulphur constantly while in attendance on a pauper, sick with the disease, and contracted sore throat, which furnished predisposition for the disease."

Dr. Bion Whelan reports an outbreak where "the servant girl was isolated in her room, and a nurse was furnished. No communication was allowed with the family in the house." This was the only case in the family.

In many outbreaks schools and churches have been closed, patients have been completely isolated, men have been stationed at public expense to supply the wants of the family, and in case of death public funerals have been prohibited.

Dr. H. B. Hemenway, health officer of the city of Kalamazoo (which city suffered an epidemic of 260 cases and 54 deaths), reported that:

Houses infected were placarded and disinfected before signs were removed. For disinfectants sulphur was used. A few houses were ordered repapered. Bed-clothing and other clothing was in some cases destroyed. No children from infected houses were permitted to go to school. The certificate of the health officer was required to admit them after all in the house had recovered. Having at first to work against public opinion and official laziness, the preventive measures were very imperfectly carried out. In several instances, however, only one out of quite a family would be sick.

In this outbreak cases were sometimes not reported. Complaint was made against one doctor who had never reported a case, and who was referred to by some "to show that it was better for people to employ a doctor who would not have the house placarded. The defendant claimed that he had mailed a report of the case" to the health officer, and it was thought best to proceed no further. D. Millard Hendrick, health officer of Vergennes township, Kent county, wrote under date of November 9, 1885:

"The physicians did not post any notice on the premises, neither did they notify any member of the health board. They told the family that the disease was not contagious, and advised the man to attend the polls election day even though he should get wet to the skin. I told the man that he ought to have stayed at home, and the Supervisor advised him to go home and stay there till there would be no danger. The family are in deep affliction and feel very hard toward the local board of health for placing a notice on their premises and restricting others from visiting them. It is my purpose to prevent school sessions until the disease is stamped out, to thoroughly disinfect the school-houses with sulphur and permanganate of potash, and when possible to send a reliable physician to disinfect house, clothing, bedding, carpets, drains, cesspools, etc."

Wm. A. Narrin, health officer of Groveland township, reports: "The family fails to comprehend the contagious nature of the disease. The case came to my knowledge through the information of a neighbor. The attending physician failed to notify the local board of health or health officer."

Dr. E. N. Palmer, health officer of the township of Columbia, Jackson

county, writes as follows: "The fourth case (another child) removed from the house until it was supposedly fumigated, but the mother had not even washed the dress she wore during the first child's sickness. The other child took the disease January 5, and died in four days." Other reports were received as follows: "We were not aware of what we had in our midst until the first child died. The physician did not report. It required quite an effort to secure immediate burial." "The local board of health knows more than all the doctors in Michigan, and does not choose to quarantine." "The Board refused to meet. There is a sad lack of sympathy among all classes with sanitary workers." "I have to contend with an able physician who claims that diphtheria is not contagious." "The doctors would not report cases or placard houses." "The first I heard of the trouble was the order for a coffin. The family was a county charge." "The doctors would not report cases or placard houses." "Doctors say, and people think, the disease is not contagious." "The precautionary measures were successful where the families united with the Board in isolating the patients and preventing visitors from entering the house. One young man persisted in going about the street, though one sister had died and another was at home sick with the disease." "Resistance was offered to quarantine and disinfection."

One health officer (A. J. Harris), under date of February 9, 1884, reports an outbreak of membranous croup, consisting of three cases and two deaths, and writes: "All the cases appear to me to have had a diphtheritic tendency." This outbreak occurred in a family of French-Canadians. No physician was called till "within thirty minutes of the death of the first patient, and two hours of the second." Dr. L. E. Ellis, health officer of Springwells township, reported "many of the city physicians pay no attention to township rules and regulations."

The following correspondence will show the customary action taken by the office of the State Board of Health on the reported outbreak of any dangerous disease in a State Institution, as well as some of the difficulties occasionally met with in collecting and disseminating information in accordance with section 9 of the act establishing the Board.\*

October 30, 1884, the following letter went from this office:

*J. F. McElroy, Superintendent School for the Blind, Lansing, Mich.:*

DEAR SIR:—It has been reported to this office that diphtheria and scarlet fever are present in the Michigan School for the Blind, and I have heard that one case was removed from the School. No case of contagious disease ought to be removed from the Institution without first consulting the health officer of this city, and no case ought to be moved to any other locality without also first consulting with the health officer of that locality and obtaining his consent and co-operation for the restriction of the disease.

I should be glad to be informed whether such removal has really taken place, and also to receive from you weekly reports of the condition of the outbreak as long as it continues.

By this mail I send you documents giving best methods of restriction, etc. Any aid which it is possible for this office to give you will be very freely rendered, if you will indicate your wishes in relation thereto.

Very respectfully,

HENRY B. BAKER, *Secretary.*

\* Section 9, Act No. 81, Laws of Michigan, 1873, is as follows:

SEC. 9. In order to afford to this Board better advantages for obtaining knowledge important to be incorporated with that collected through special investigations and from other sources, it shall be the duty of all officers of the State, the officers, physicians, etc., to furnish information. Duty of State officers, physicians, etc., to furnish information. agents of any company chartered, organized, or transacting business under the laws of this State, so far as is practicable, to furnish to the State Board of Health any information bearing upon public health which may be requested by said board for the purpose of enabling it better to perform its duties of collecting and distributing useful knowledge on this subject.



LANSING, MICHIGAN, {  
October 31, 1884. }

Henry B. Baker, Secretary State Board of Health, Lansing, Mich.:

DEAR SIR:—I am in receipt of your letter of the 30th inst.; also blanks for reports of health officer, circular of the work of health officers and of local boards of health in Michigan, a circular letter concerning diphtheria, referring to copies of documents which have been translated into German, Holland, French, Swedish, Polish, and Danish-Norwegian languages; also circular letter concerning scarlet fever which has been translated into ditto languages; also I am in receipt of thirty copies of circulars concerning Scarlet Fever and Diphtheria (revised edition, 20,000 printed) where one or two copies of each would have been altogether sufficient; also Laws of Michigan relating to public health, for all of which please accept my acknowledgments.

There are a few points in your letter to which I wish to call your attention. You say that, "It has been reported to this office that diphtheria and scarlet fever are present in the Michigan School for the Blind, and I have heard that one case was removed from the School." Then you proceed to lecture me for not consulting the health officer of this city before a case of contagious disease is removed from the Institution; then you say that, "No case ought to be moved to any other locality without also first consulting with the health officer of that locality and obtaining his consent and cooperation for the restriction of the disease," all of which advice is very wise, but it is not applicable to the case in hand.

I have been thinking since I received your letter of what an awful liar your informant must be. He says that we have scarlet fever in the Institution, whilst as a matter of fact we have not, and have not had a case of scarlet fever since the Institution was established. He then informs you that a case of scarlet fever or diphtheria was removed from the School, whilst the truth is no pupil has ever been sent or allowed to leave the School who was afflicted or, to my knowledge, had been exposed to any kind of contagious disease. I must confess some little surprise when I found that on the strength of the report of such an imaginative informer, you should collect such a mass of circulars, blank reports, laws, documents, and a good share of the above-mentioned 20,000 copies, and proceed to dump them on my head. Please do not think that I consider these papers valueless, for there is one on diphtheria which may be of some service to us, but, as you sent me about a dozen copies some time ago, I have no particular need for a fresh supply.

Now for what was probably the foundation of the stories you have heard. Last Monday one of our boys was taken sick. Tuesday morning the doctor pronounced the symptoms those of diphtheria. The boy was at once isolated in the hospital, the rooms thoroughly disinfected, notice, was given to the health officer, and notice of diphtheria put up, all visitors to the Institution forbidden admission, and everything was done to restrain the disease which common sense could suggest, of which common sense you will please give us credit for having a small supply, even if your informant should report to the contrary.

We have succeeded in isolating the case as far as we can tell at this time, no indications of the disease having appeared in any other pupil. In this, of course, we cannot be certain for some time yet. I will in due time make further report of this single, genuine case of diphtheria, which is all we have ever had. At present writing the boy is very low, his case having assumed a malignant form.

Yours truly,

J. F. McELROY,  
Superintendent Michigan School for the Blind.

In answer to the above communication, the following letter was sent from the office of the State Board of Health, November 3, 1884:

J. F. McElroy, Superintendent Michigan School for the Blind, Lansing, Michigan:

DEAR SIR:—Please accept cordial thanks for your letter of October 31, which was received this morning. In writing to you, and in sending documents on the restriction and prevention of diphtheria and of scarlet fever, and in requesting a special report from you relative to the disease believed by me to be present in your institution, I followed the usual custom of this office, which is to act immediately upon information, whenever it is believed to be correct. It is on precisely the same principle that an alarm of fire would call out the fire department. In case there is no fire no harm is done; in case there is, and the fire department should wait for complete and definite information before taking any action, great harm might ensue. I sent you a number of documents with the thought that there were a number of people connected with your institution, teachers, housekeepers and workmen, capable of understanding and putting in practice the directions of the State Board of Health, for the restriction and prevention of contagious diseases, and to whom you would be glad to distribute them to enable them better to aid in preventing the spread of diphtheria. Your letter stating that "one or two copies would have been altogether sufficient" I cannot understand, because, if interpreted literally, it leads me to infer one of three things: either there are no such persons connected with your institution; that they are already thoroughly informed on this subject, or that it is of no particular consequence whether they become informed or not, no one of which statements is probably entirely true. I therefore trust you will place the documents where they will do the most good.

Although the person who informed me of the presence of contagious disease in the school was not altogether correct in his beliefs, I am indebted to him for the first information of the outbreak, which is in all cases important to this office, since the earlier we are informed of an outbreak the easier we can trace its origin, and the better we may act our part to prevent its further spread.

Trusting that you may be able to confine this outbreak of diphtheria to the single case, and hoping to receive weekly reports of its progress, and a full final report, I remain,

Very respectfully,

HENRY B. BAKER, *Secretary*.

#### PERIOD OF INCUBATION IN DIPHTHERIA.

Of the 26 health officers who stated the period of incubation, twelve make the period more than two, and less than six days; eleven report ten days or less; one reports from four to thirty days; one from six to thirteen days; and one from seven to fourteen days.

Besides the 26 health officers who state the period, others reported facts bearing upon the subject:—

W. P. Gamber, health officer and clerk of McBrides, wrote facts bearing upon the period of incubation of diphtheria, during the months July 21,—December 14, 1884: “Number three was taken sick six days after number two, in the same house; number seven washed the clothes of number two after his death, and acted as a nurse for number three, which makes the period of incubation fifteen days from the date of first exposure. The rest were not exposed to the disease as we are able to learn.”

In the outbreak reported (on page 261 of this report) by Dr. J. E. Scallon, health officer of the township of Hancock, Houghton Co., the period of incubation seems to have been five and seven days respectively, in two cases concerning which the facts were stated.

Dr. Nathan Webb, health officer of Pittsfield township, reports concerning an outbreak in the township of Ypsilanti: “The first case had visited in a township forty miles away with a family that had just recovered from diphtheria. In just six days after her return she came down.”

Dr. A. S. Martin, health officer of the township of Texas, reports that he has found six to twelve days to be the usual term of incubation, but “there is no disease in which the incubatory stage is so uncertain.”

#### DIPHTHERIA MISTAKEN FOR OTHER DISEASES.

In some cases this disease has been otherwise named, as follows: “Quinsy,” “first called worms, then quinsy;” “membranous croup, with diphtheritic tendency.” “I was called to see a little girl of eight years who had had no medical attendance. The mother thought it was a case of tonsilitis. The child died in ten hours from date of visit.”

W. B. Hathaway, M. D., health officer of the township of Bloomingdale, writes concerning an outbreak of diphtheria in a family of two boys and one girl, aged respectively 13, 11, and 8 years:

“The little girl and the eldest boy were attacked at nearly the same time with symptoms of diphtheria. They all attended the Union school in the village, and the parents, thinking it to be ‘only a little sore throat,’ continued to send them to school for two days after the attack. On the third day they called in a physician who diagnosed the cases to be tonsilitis; on the fourth day his diagnosis was putrid sore throat; on the sixth day he reported them to be diphtheria, and on the eighth day the little girl died. The boy’s case was not so rapid in its progress; he survived the girl seven days, and the diphtheritic membrane having formed below the larynx he died very suddenly. The younger boy, who was taken sick soon after the others, has recovered. The disease in this family was very malignant, the younger boy barely escaping death.”

A. S. Martin, M. D., health officer of Texas township, speaking of cases which were pronounced “tonsilitis by the attending physician,” writes as follows:

"Were they cases of tonsillitis or were they of a diphtheritic nature, cases in which the disease germs were not sufficiently developed to establish a fully developed case? Allowing the germ theory to be correct there must be a period when the disease is imperfectly developed. If at this stage, by medical intervention or otherwise, a check is placed upon the formative process it does not follow that the disease is ended. Circumstances may favor a further development of the germ and the process may go on after weeks of inaction. At least such has been my experience since I became acquainted with the true nature of the disease, which was in 1860. Certain localities in Wisconsin were visited with epidemics of diphtheria during my sojourn in that State. And at one visitation in particular I noticed in almost every case, first a primary attack from which the patient would make complete recovery. After a lapse of from one to two weeks the patient would be taken again, the disease would then develop fully. Such cases seldom proved fatal, and those that did die generally died from paralysis after a lapse of six or eight weeks."

In this connection is a letter from E. J. Marshall, M. D., health officer of the city of Marshall, concerning an epidemic sore throat, somewhat resembling diphtheria:

"There seems to be an epidemic *sore throat* prevailing in this city. It made its first appearance a little over two weeks ago, and in nearly every case goes through the whole family, especially the children. It is characterized by the following symptoms: Frequent chills, accompanied with bone pains, fever, nausea, and vomiting, redness of the tonsils, palate, and posterior part of the throat, enlargement of the maxillary glands, tongue coated white, or a dirty white, loss of appetite, with general prostration, recovery in from three to seven days. If there was any membrane present I should not hesitate to diagnose them mild cases of diphtheria, but as yet I have not been able to detect any, neither is there any discharge from the nose. I have frequently witnessed cases as above described in epidemics of malignant diphtheria. I do not think it proper to call them diphtheria. I have diagnosed them tonsillitis. From my past experience in this dreaded disease I will not be surprised to find a bad case of diphtheria in one of these families at any time. I have cautioned each family to be careful about exposing others. Any suggestions will be thankfully received.

"E. J. MARSHALL, *Health Officer City of Marshall.*"

In reply to this letter a communication went from this office stating that the same disease was somewhat prevalent in the city of Lansing, and that it seemed to be associated with influenza, and, like it, contagious; that no cases of diphtheria had been known to arise from it.

## SCARLET FEVER IN MICHIGAN—YEAR ENDING DECEMBER 31, 1884.

Each year the reports received by the State Board of Health have increased in value, and the methods employed in the office of the Board in gathering and compiling the same have been corrected and improved.

The reports of the number of cases and deaths from scarlet fever during the calendar year ending December 31, 1884, compared with the same reports for the preceding fiscal year, ending September 30, 1883, give very gratifying results, probably in some degree due to the better measures taken by local health authorities in restricting the spread of the disease.

By means of weekly and special reports received near the time of the occurrence of the disease and special final reports received soon after the outbreak was over, one hundred and seventy-two outbreaks of scarlet fever in one hundred and forty-four localities were reported during the year ending December 31, 1884. In these outbreaks there were reported 1,556 cases and one hundred and twenty-three deaths, an average of nine cases to an outbreak. The per cent of deaths to cases was eight. The annual reports of health officers and clerks, made at the close of the year, give additional cases and deaths not reported when they should have been, which bring the number of reported cases, for the year 1884, up to 2,476, and the number of reported deaths up to two hundred and thirty.



The following table gives a portion of the reported cases and deaths, but does not include those reported only by letter, or on the ["M"] blank for making weekly reports, or any other method of making reports except on the "Special Final Report" blank sent from this office for use soon after the outbreak was over. In the outbreaks not mentioned in this table, the health officers did not make a complete final report on the blank sent them for that purpose. Forty-seven health officers made such reports, relative to fifty-three outbreaks.

TABLE.—*Stating names and localities of Health Officers who made special final reports relative to scarlet fever, upon blank form "K" for that purpose; also the number of cases and deaths from scarlet fever reported in this manner by them in their localities for the year ending December 31, 1884.*

NAMES OF HEALTH OFFICERS.	DIVISIONS AND LOCALITIES.	Cases of Scarlet fever.	Deaths from Scarlet fever.
	Total in 53 Outbreaks in 47 Localities..	423*	51*
	UPPER PENINSULAR DIVISION.....	6	1
Dr. J. E. Scallon.....	Hancock, Houghton County.....	6	1
	NORTHWESTERN DIVISION.....	12	3
Peter E. Gustaff.....	Leelanaw, Leelanaw County.....	4	1
A. T. Vance.....	Clam Lake, Wexford County.....	8	2
	NORTHERN DIVISION.....	33	8
John Hammond.....	Eveline, Charlevoix County.....	27	7
James J. McLaughlin.....	Elk Rapids, Antrim County.....	6	1
	WESTERN DIVISION.....	79	9
Dr. N. W. Andrews (2 outbreaks).....	North Muskegon, Muskegon Co.....	5	0
Charles Conklin.....	Leavitt, Oceana County.....	1	0
A. A. David.....	Sherman, Newaygo County.....	6	1
M. E. Earl.....	Bridgeton, Newaygo County.....	3	0
Dr. D. N. Flora.....	Newaygo, Newaygo County.....	2	0
Dr. Roderick C. Hepburn.....	Ewart, Osceola County.....	12	1
Bryan Monaghan.....	Rose Lake, Osceola County.....	11	2
Dr. E. H. Wood.....	Hersey, Osceola County.....	39	5
	BAY AND EASTERN DIVISION.....	117	14
Dr. John S. Caulkins.....	Dryden, Lapeer County.....	3	0
Dr. Charles Davis.....	Sand Beach, Huron County.....	6	1
Dr. Wm. H. Gowan.....	Brockway, St. Clair County.....	4	0
Dr. D. M. Jones.....	Berlin, St. Clair County.....	24	3
Dr. L. C. Read.....	Watertown, Sanilac County.....	13	1
Dr. W. H. Smith.....	St. Clair, St. Clair County.....	17	1
Dr. J. P. Webster.....	West Bay City, Bay County.....	50	8
	CENTRAL DIVISION.....	61	12
Dr. J. B. F. Curtis.....	Hazleton, Shiawassee County.....	6	2
Luther J. Dean.....	North Star, Gratiot County.....	10	2
Dr. A. H. Forsyth (2 outbreaks).....	Cato, Montcalm County.....	2	0
Dr. J. N. Hathaway (3 outbreaks).....	Howard City, Montcalm County.....	5	0
Dr. L. Joslin.....	Ionia, Ionia County.....	3	1
Dr. J. T. Kilbourn.....	Maple Valley, Montcalm County.....	8	1
A. D. Pollock.....	Wheatfield, Ingham County.....	9	3
Dr. C. S. Park.....	Hubbardston, Ionia County.....	1	0
Dr. C. N. Silsbee (2 outbreaks).....	Orleans, Ionia County.....	3	1
Dr. James Totten.....	Pierson, Montcalm County.....	4	0
J. P. Taylor.....	Bloomer, Montcalm County.....	5	2
Dr. F. A. Weaver.....	Chester, Eaton County.....	7	0
	SOUTHWESTERN DIVISION.....	41	1
Dr. Henry P. Everts.....	Dorr, Allegan County.....	11	0
Dr. O. P. Horn.....	Niles, Berrien County.....	5	0
Dr. Charles O. Podley.....	St. Joseph, Berrien County.....	25	1
	SOUTHERN CENTRAL DIVISION.....	45	0
Dr. A. L. Ambrose.....	Hanover, Jackson County.....	2	0
Dr. O. Fowle.....	Moscow, Hillsdale County.....	5	0
Dr. R. J. Gillespie.....	Fawn River, St. Joseph County.....	15	0
Dr. A. A. Martin.....	Albion, Calhoun County.....	2	0
Dr. C. H. McKain.....	Vicksburg, Kalamazoo County.....	16	0
Henry R. Palmer.....	Bridgewater, Washtenaw County.....	4	0
Dr. H. W. Whitmore.....	Allen, Hillsdale County.....	1	0
	SOUTHEASTERN DIVISION.....	29	3
Dr. C. L. Chandler.....	Richmond, Macomb County.....	15	0
Dr. W. Flagler.....	Arnada, Macomb County.....	2	1
Michael Gramlich.....	London, Monroe County.....	6	0
Dr. R. M. Johnson (2 outbreaks).....	Novi, Oakland County.....	5	2
Dr. L. J. Magee.....	Trenton, Wayne County.....	1	0

\* By means of these special final reports, from which this table was made, and other reports made at or about the time of their occurrence, 172 outbreaks of scarlet fever in 144 localities were reported in Michigan in the year ending December 31, 1884, and in these outbreaks 1,556 cases and 123 deaths were reported. † Clerk of the township board.

According to all reports received near the time of their occurrence, the number of outbreaks in each division of the State was as follows: Upper Peninsula Division, 5; Northwestern Division, 7; Northern Division, 5; Northeastern Division, 1; Western Division, 18; Northern Central Division, 3; Bay and Eastern Division, 26; Central Division, 44; Southwestern Division, 11; Southern Central Division, 37; Southeastern Division, 15. From this it would seem that in 1884 scarlet fever was most prevalent in the central and southern-central parts of the State.

The greatest number of cases and deaths in one locality occurred in Detroit—the largest city in the State—where there were six hundred and two cases and forty-one deaths. In the Upper Peninsula only five outbreaks with seventeen cases and one death were reported. Outside the two great cities of Detroit and Grand Rapids, where the disease prevailed throughout the entire year, the greatest number of outbreaks began during the month of April, while during the months of March, April, and May nearly one-half of all the outbreaks began. During these three months three-fifths of all the deaths reported occurred.

#### SCARLET FEVER IN 1884 COMPARED WITH 1883.

The facts are not yet reported with such certainty as to enable us to make very useful comparisons, one year with another, and the methods of compiling the facts have been undergoing modification,—thus this is the first time that a search has been made through the annual reports made at the close of the year, to see if they agree with the special reports made near the time of the occurrence of the contagious disease, and the result is that many cases are found reported at the close of the year which were not reported as they should have been near the time of their occurrence. In attempting to compare the year 1884 with the preceding year, it will not answer to include these additional cases, because they were not previously included. By means of special reports similar to those on which there were returned for the calendar year 1884, one hundred and seventy-two outbreaks in one hundred and forty-four localities, 1,556 cases and one hundred and twenty-three deaths, there were reported for the fiscal year ending September 30, 1883, one hundred and sixty-four outbreaks in one hundred and fifty localities, with 1,802 cases and two hundred and forty-eight deaths,—an average of eleven cases to each outbreak, and the per cent of deaths to cases was nearly fourteen. Thus while there were eight more outbreaks reported in 1884 than in 1883, there were two hundred and forty-six less cases, and only about one-half as many deaths reported. This apparent reduction in the number of cases to the outbreak and the number of deaths to cases in 1884 as compared with 1883 was probably not due to better reports being received during the year 1883, because more blanks for making reports were sent out and more pains were taken to secure prompt and correct reports during the year 1884 than in any previous year, and it is believed that more complete reports were received during this year. If the reduction of the number of cases to the outbreak was not apparent only, but real, it was probably due to the prompt precautionary measures that were taken by local health authorities to isolate those sick with the disease, to thoroughly disinfect all articles of clothing and furniture used by the sick, and to the liberal distribution of State Board of Health circulars on the "Restriction and Prevention of Scarlet Fever."\*

\* Twenty thousand copies of the revised edition of the pamphlet on the "Restriction and Prevention of Scarlet Fever," were ordered by the State Board of Health to be printed in March, 1884, at which time these documents were being sent from the office of the State Board at the rate of about five hundred per week. This revised pamphlet was first sent from this office in May, 1884.

The difference between the two hundred and forty-eight deaths reported for the fiscal year 1883. and the one hundred and twenty-three deaths reported for the calendar year 1884 shows an apparent saving of one hundred and twenty-five lives in 1884; but it should be constantly held in mind that scarlet fever is a disease which, when not restricted, decreases and then increases in waves, the crests of which are quite frequently about five years apart, probably because children under five years of age are most susceptible to the disease, and after all the children in a locality have had the disease, a period of time must elapse before there is a sufficient number of susceptible children present to permit of a very considerable number of cases of the disease.

#### MEASURES TAKEN FOR THE RESTRICTION OF SCARLET FEVER, AND RESULTS.

During the year ending December 31, 1884, in thirty-five localities the outbreaks were limited to one case. During the previous year the disease was so restricted in only thirteen localities. Many outbreaks in 1884 were limited to two or three cases, while in some localities the outbreak was confined to one family. One health officer reported concerning ten cases of scarlet fever, with two deaths during the month of April, 1884, that, by means of the immediate posting of notices and a liberal use of disinfectants "no case occurred outside of the two dwellings where the disease first appeared." Another health officer wrote concerning nine cases, and three deaths occurring May 22-July 10: "The schools were closed and the patients were thoroughly isolated. The clothing was fumigated each day with sulphur fumes. The disease was confined to the two families where it originated." Dr. N. W. Andrews, health officer of the village of North Muskegon, reported concerning scarlet fever in that village, in the month of February, 1884: "As prompt measures as possible were taken to isolate those sick, and prevent contact with not only person but household articles. All cloths, etc., used, were thoroughly disinfected, as were the discharges from the patient, a solution of zinc and a solution of iron sulphate being used. Discharges were buried, and the rooms were fumigated after the patient's recovery. The success attending these efforts was as follows: There were only four cases, three in one family. the fourth not from any contagium derived from the other three." Dr. Wm. H. Gowan, health officer of Brockway township, St. Clair county, reported concerning four cases of scarlet fever in November: "I placed a man on duty to supply the wants of the family, and allowed none to go in or out. I saw that the house was thoroughly disinfected with sulphur, and that the paper was removed from the walls." These cases were confined to one family. One health officer wrote in December of a case of scarlet fever occurring in a lumber camp where sixty-five hands were employed. The patient was thoroughly isolated from the rest of the camp, and the disease spread no further. But the lumbermen were probably adults, among whom this disease does not tend to spread. J. P. Taylor, clerk of Bloomer township, wrote concerning scarlet fever in his jurisdiction December, 1884: "The families were closely quarantined and disinfectants were used. The schools, churches, and skating rinks were closed."

Forty-seven health officers made fifty-three final reports; forty-eight reports stated that measures had been taken to restrict the disease, and forty-six stated that the efforts at restriction were successful. Thirteen health officers reported that they had used sulphur as a disinfectant, while seventeen answered the question on the blank, "What measures were taken to restrict the disease?" by replying "fumigation" or "such disinfection as is prescribed by law," or "the rules laid down by the State Board of Health," and other similar answers



which would lead me to think that fumigation by burning sulphur was also the disinfectant used in those cases. These thirty health officers in every instance reported that their efforts were completely successful in restricting the spread of the disease. Dr. F. A. Weaver, of Chester, Eton county, who used sulphur burned in a close room as a disinfectant, reported that no case had occurred outside of the one family, though, since disinfecting the house, children had been playing there.

A letter was received from Adam Price, M. D., health officer, Almont, Mich., dated May 12, 1884, reporting an outbreak of scarlet fever in that village, and stating that the board of health had held a meeting and passed resolutions to close the schools, churches, and all places of amusement; that under the latter head they mentioned a skating rink. The writer states: "There have already been cases taken sick in the rink and one family in the country are now sick, and it is supposed they took the disease by the father carrying the contagium from the skating rink." The writer also states that the proprietors of the skating rink had closed when directed, but had given notice that they would open again in spite of instructions, and asks what could be done in such a contingency. As the law in this case is applicable to all villages incorporated under the general act for incorporation of villages, the letter sent from this office in reply to the above communication is here printed in full:

MICHIGAN STATE BOARD OF HEALTH,  
*Office of the Secretary, Lansing, Michigan, May 13, 1884.*

*A. Price, M. D., Health Officer, Almont, Michigan.*

DEAR SIR:—Yours of May 12, asking for advice in regard to closing the skating rink in your place is at hand. The village of Almont was reincorporated by the Legislature by act 354 of 1879, subject to and under the provisions of the general act for incorporation of villages, being act No. 62 of 1875. Section 48 of chapter VII. of act 62 of 1875, added by act 245 of 1879 (being § 2894 of Howell's Annotated Statutes), seems to me to give the council sufficient authority to close a skating rink, if necessary to prevent the spread of scarlet fever.

Sections 48, 53, and 54 of chapter VII, act 62 of 1875 (added by act 245 of 1879, and being §§ 2894, 2899, and 2900 of Howell's Annotated Statutes), taken in connection with §§ 1671, 1672, 1674, and 1681 of Howell's Annotated Statutes, seem to me also to give the common council sufficient authority, where they deem it necessary so to do, to restrain the inmates of a house where there is scarlet fever, from going abroad. Section 1 (clauses *third* and *seventeenth*) of chapter VII. of act 62 of 1875 (§ 2847 of Howell's Annotated Statutes), also seems to give the council sufficient authority for this.

If the village has a board of health, distinct from the council, organized under section 55 of chapter VII. of act 62 of 1875, (added in 1879, being § 2901 of Howell), its power in relation to the subject depends in part on what authority has been conferred on it by the council. But under sections 1671, 1672, 1674, and 1681, of Howell's Annotated Statutes, it would seem to have authority to restrain inmates of infected houses, if not to close a skating rink.

I think you would do well to consult the attorney of your village, or the prosecuting attorney of the county, perhaps referring him to the sections I have named.

Very respectfully,

HENRY B. BAKER, *Secretary.*

#### OUTBREAKS IN WHICH HEALTH REGULATIONS WERE NOT RESPECTED.

As great as was the reduction in the number of cases and deaths in the year 1884, it cannot be doubted that the number might have been further reduced if the injunctions of the health authorities had been obeyed. The success attending cautionary measures will not be complete until all communication on the part of neighbors with those sick with this disease shall be thoroughly under the control of health authorities, until the door is closed to all friends except such as come to stay, and children in the same family are excluded from the patient's room. One health officer writes that it was almost impossible to keep the neighbors from calling upon the patients. Dr. R. J. Gillespie, health officer of Fawn River township, reported: "Everywhere that the

restrictions were respected the disease vanished rapidly, but precautionary measures have not been taken by some doctors to prevent the spread of the disease." Another health officer reported that not one-fifth of the cases of scarlet fever in his jurisdiction were reported to him by the attending physicians. In one locality people are reported as "extremely careless in regard to spreading contagious diseases."

N. J. Carey, health officer of Colfax township, Mecosta county, under date of April 12, 1884, reported: "I find that the law is almost entirely disregarded in this part of the country, which provides for the isolation of those sick with contagious diseases, and the disinfecting of clothing and premises. A few weeks ago in a neighboring town a child had the scarlet fever. Neither the householder nor the attending physician reported the case to the health officer. No notice was put up. The child died. The brother of the child's father attended the funeral. In a week or so his two children were taken sick, one of them being buried yesterday. Two children of another brother, who attended the funeral, are also sick with the scarlet fever, and have neither put up notices or notified the board of health."

There is also reason to believe that not all outbreaks of scarlet fever have been reported to the State Board of Health by health officers. June 2, 1884, a formal complaint was made to this board by a local board of health in the vicinity of Traverse City that scarlet fever and other contagious diseases were not properly dealt with in that village. On the receipt of this communication a letter reciting the case was sent to the health officer of Traverse City. A similar communication went to the president of the village, substantially as follows:

DEAR SIR: A formal complaint has been made to this board by a local board of health in the vicinity of Traverse City to the effect that scarlet fever is present in Traverse City, and that no proper measures are taken or have been taken in the past to instruct the people as to the contagious nature of this disease, or to prevent the spread of this and other communicable diseases into the adjoining townships; that physicians are not required to report this class of diseases to the health officer, and especially that no proper care is taken to placard houses or to prevent persons from going in or out at will, and that as a result of this neglect on the part of the health authorities of Traverse City, many cases of contagious disease have in the past been carried into neighboring townships and are so spread at present, resulting in a large unnecessary expense to the townships and a criminal loss of life.

Inasmuch as this is not the first time that such charges have been made against Traverse City by local boards of health in your vicinity, I trust you will give the matter your careful attention, and, if proper measures for the prevention and restriction of the contagious diseases have not been taken in the past, they may be so taken hereafter.

By this mail I send you a package of documents such as this board recommends local boards of health to distribute to the neighbors in localities where scarlet fever is present. I can send you copies in the English, German, or Holland languages, and copies of the two-page leaflet also in French, Polish, and Scandinavian languages. Please let me know if you can use any more of them to advantage and I will send them. It will give me pleasure to co-operate with you in any manner for the restriction of scarlet fever or any other communicable disease.

Very respectfully,

HENRY B. BAKER,  
*Secretary.*

A letter dated February 21, 1884, was received at this office from Dr. C. L. Van Pelt, of Toledo, Ohio, stating that a case of scarlet fever had been reported to the health office in that city about a week before; that the patient had been visiting from Saturday to Thursday at a house in Adrian, Mich., near the depot; that during his visit he had learned that there had been cases of scarlet fever in the house about two weeks before, and that the house had never been disinfected. The letter concludes as follows: "In Michigan the people ought to be pretty well educated upon these points. I send you this

for common good, as the man told me he knew of others stopping at the same house." On receipt of this letter a communication was immediately sent to the health officer of the city of Adrian, stating the facts in the case, and asking him to investigate the subject and report, as well as act for the prevention of the further spread of the disease from that source. The health officer replied, March 7, 1884, that he had not time to investigate such matters, and that he could not afford to spend his time for nothing; that he had often tried to get physicians interested in such matters, and that he had been obliged to threaten with prosecution. On the receipt of this communication a letter was sent to the mayor of the city of Adrian stating the facts in the case, and expressing the opinion that the city should take proper measures to prevent the spread of contagious diseases, and that the health officer should have ample and certain compensation.

One health officer reported that he in no case used any means of disinfection in the houses where cases of scarlatina occurred, and that in no instance did any householder disinfect his own house. As a result of this outbreak there were 39 cases of scarlet fever and five deaths. Concerning this outbreak the health officer writes: "The disease spread slowly and surely until nearly all available material was attacked, i. e., until all children liable to the disease were affected except those who kept indoors in the strictest seclusion. It spread throughout nearly all the country adjacent to the village. One adult received the contagium here and died at a distance."

Dr. W. Flagler, health officer of Armada village, said: "In the first case which terminated fatally, practically no measures whatever were taken to restrict the disease. The physician in charge told the attendants that it was not contagious, and enjoined neither isolation or disinfection. He also neglected to report the case to the local health authorities. Several neighbors including children attended the funeral and viewed the corpse."

#### SCARLET FEVER MISTAKEN FOR OTHER DISEASES.

In some cases restrictive measures were not taken because the disease was not correctly diagnosed. Dr. R. C. Hepburn, health officer of the village of Evart, wrote July 31, 1884, concerning scarlet fever in that village: "I attempted to isolate the family, but the attending physician said that it was not scarlet fever and prevented me from doing so. After the first case a young woman and her child, two and one-half years old, were brought to the house and were assigned to the room occupied by the first case. In three days the child was taken sick and went through all the stages of scarlet fever." This case terminated fatally after about twenty-five days.

Dr. D. M. Jones, health officer of Berlin township, St. Clair county, reported:

"It was almost impossible to keep patient isolated from other members of household, or the members of the same from visiting and neighbors from calling. The outbreak began in the most malignant form; but it grew lighter, some cases having very little rash and sore throat. It was pronounced by the attending physician 'acute tonsillitis,' and was not restricted for some days. Others received the contagium and spread it in adjoining townships, where the disease occurred in a malignant form—the result of mistaken diagnosis."

Dr. Charles H. McKain, health officer of the village of Vicksburg, reports: "Methods here were very unsuccessful, owing to a difference of opinion among the physicians here as to the nature of the disease. Some were quarantined, while others were suffered to be on the streets." Dr. McKain writes further of this outbreak as follows:



"On the 29th day of March, 1884, a young lady from Schoolcraft township came to this place and visited several families and saw many children on the street. She was convalescing from quite a severe illness which she had been through while at Sherwood, Mich., attending school. I learned that the school at that place had suffered an epidemic of German Measles (so called) from which there was one fatal case, I believe. The prominent symptoms of the disease were high temperature, sore throat, and an abundant fine scarlet rash, followed by desquamation, and this lady was in the desquamative stage while she visited this place. April 1st her little brother came down with what seemed to me veritable scarlet fever, and by the nineteenth or twentieth of the same month cases appeared in this village, and were reported to me as scarlet fever. I think cases occurred here as early as the tenth of April that were not reported. From that date until the middle of November many cases occurred here, but most of them were mild, and many were not reported at all, but suffered to go out, while convalescing, and expose others."

This disease also spread from Sherwood to Three Rivers, and Dr. Wm. M. Ikeler, health officer of the village of Three Rivers, wrote concerning this outbreak as follows:

"Children in Sherwood are allowed to roam the streets, attend the schools, and no efforts are made to arrest the spread of the disease. One little boy came on the train to our village just as the rash was disappearing. The result is that one young lady is very sick with scarlet fever."

This disease was also carried from Sherwood to Kalamazoo, and there pronounced scarlet fever.

Concerning the outbreak in the township of Sherwood, Dr. Robert Fraser, of that township, writes July 3, 1884, as follows:

"The cases which I treated were genuine cases of scarlet fever with every symptom well defined; sore throat and desquamation, the rash first appearing on neck, face and chest, and in twenty-four hours covering the entire body. I reported my cases to the health officer. He called the disease 'German Measles.'"

Dr. L. R. Daniels, health officer of Sherwood township, writes concerning the epidemic in that township as follows:

"When it first showed itself, which was about three months ago, I examined all the cases that came down and pronounced it not scarlet fever. I have had under my care about twenty-five cases in all, and I believe I have had a chance to see what it was. No bad effects have come from any of the cases, and I will stake my reputation as a physician that there has not been a case of scarlet fever in or around this town. \* \* \* \* This disease has not interfered with our schools at all, and has not been noticed here."

Dr. O. F. Seeley, health officer of Climax township, wrote of two cases of scarlet fever in April: "The source of contagium was an adjoining township where the board of health declared the disease not to be scarlet fever."

Dr. R. J. Gillespie, health officer of Fawn River township, reported a case where three physicians pronounced the disease scarlet fever while one claimed that it was "German Measles." From the symptoms, as described by the health officer, the disease was probably scarlet fever. Dr. J. P. Webster, health officer of West Bay City, reported that in a few cases scarlet fever was complicated with diphtheria.

Dr. R. A. Martin, health officer of the village of Albion, April 7, said of scarlet fever in that village: "The visit (of patient convalescing) occurred March 23. March 26 I was called to see a child in the family visited by the convalescent children. It had been taken violently ill March 25 about noon with vomiting and diarrhoea. I was called at noon, March 26, and found the child with a temperature of 105 and a pulse of 140, and weak. The child was apparently greatly oppressed about the head. In two hours it was dead. On the night of March 28, an older child was taken sick with much the same symptoms but milder. Dr. Thomason was called. March 31 we concluded that it was a case of scarlatina. Now was the case that died a case of malignant scarlatina? There was no eruption. I did not see it after it died."

Dr. John S. Caulkins, health officer of Dryden township, writing concerning scarlet fever during the month of December, said :

"The disease was marked scarlet fever by me after some hesitation. The temperature was never over 100° Fahr. Sore throat and eruption were characteristic. The peeling, however, came on at the proper time and in as thorough a manner as I ever saw. The conclusion forced upon us by this case is that we must give up the notion, so much insisted on, that scarlet fever is attended where it erupts fully with a greater development of heat than all other specific fevers."

Some health officers reported cases of so mild a type that parents "took no notice of it."

Dr. Geo. D. Allen, health officer of Portland village, reported concerning four cases of scarlet fever during the months of October and November: "The patients had visited friends in Woodland, Barry county, who were sick with what they called 'scarlet rash.'" Dr. A. H. Forsyth, health officer of Cato township, said that the source of contagium was "infection from a visiting child who was in the period of desquamation from what was called 'scarlet rash.'"

#### SOURCES OF CONTAGIUM OF SCARLET FEVER.

Of the 51 Special Final Reports of health officers who answered question 3, as to the mode of the introduction of scarlet fever, 27 reports stated that the source of contagium was unknown, while 24 stated that the disease could be traced to its probable source, either within or outside of their jurisdiction.

A large number of those who could not find the source of contagium reported "source unknown;" one reported two cases, one-half mile apart, with no known communication between them; another reported that "six cases, two in each locality, occurred simultaneously, and the families had had no known intercourse whatever with one another;" one health officer said: "The families do not live near each other, and have not been together. Many people from a distance have been here during the last two or three weeks picking and buying blackberries;" another health officer writes: "That particular neighborhood or locality has been subject to the disease for many years, and I know of no other source of contagium unless it be small swampy places containing stagnant water." How a contagious disease like scarlet fever can be caused by swampy places is not clear.

Some of the health officers mentioned above as being able to trace the disease to its source, and others who did not make special Final Reports, but who gave information by letter or otherwise, reported facts bearing on the source of contagium as follows: In many cases the contagium was carried from an adjoining township. Thirteen health officers reported that the contagium was carried in the clothing; in one case by the clothing of a physician, in another case by the clothing of a man who had nursed a child in an adjoining township. One health officer reported that "two weeks previously the father of the patient was peddling from house to house in the city of Port Huron where the disease prevailed." Another health officer said that the contagium was carried by the clothing of a lady from Chicago, who lived in a house next to one where scarlet fever prevailed.

April 26, Dr. O. P. Horn, health officer of the city of Niles, reported as follows: "The aunt of the child, which was first taken sick with the scarlet fever, had been in Jackson nursing those afflicted with the same disease. After her return the child visited her and played with the dress worn by her while in Jackson." One health officer believed that a patient in his jurisdiction contracted the disease at a public meeting in a neighboring township where the

disease then prevailed. In two cases the disease was taken from patients convalescing from scarlet fever.

Dr. Adam Price, health officer of the village of Almont, reported an outbreak where the source of contagium was supposed to be a corpse brought from a neighboring city for burial. The body was interred March 14, and the first case occurred April 1.

Dr. A. L. Ambrose, health officer of Hanover township, Jackson county, reported three cases of scarlet fever where the source of contagium was a washtub which had been used several weeks previously by a family having the scarlet fever. In four cases the contagium was left in houses that had not been properly disinfected. In one case the germs of the disease remained in bedding that had been used by a scarlet fever patient six or seven months previously. In one case the disease was taken from "old rags of 18 to 20 months standing."

Nov. 19, Dr. N. W. Andrews, health officer of North Muskegon, writes: "There was, some six or eight months ago, a mild case of scarlet fever in the adjoining house; at the time, the people who now have the case had some household furniture stored there, which has lately been moved into their own house. I can find no other cause for the outbreak than that the contagium was communicated by means of the tapestry, which had been stored in a room where the child when sick had been allowed to go."

The following interesting statements are extracts from a letter, received Aug. 23, 1884, from Rev. Fayette Hurd, of Grand Blanc, Mich., giving facts concerning scarlet fever near the village of Laingsburg, Shiawassee Co., during the month of Dec., 1880:

"About Dec. 20, 1880, the family were in the garret of the house gathering up rubbish that had been collecting there for some time. They put into a basket to be burned a number of magazines, pictures, pieces of cloth, window curtains, carpet-rags, and an old rubber doll, which belonged to a family that had the scarlet fever in the same house during the winter of 1874-75. The boys gathered up a good many of the pictures and the girl took the doll, which belonged to the child who had the disease in 1874, and was, I think, used by her when sick with scarlet fever. The curtains were hung in the windows of the room during the sickness in 1874-75. The things saved out were used by the children for two or three days. The rest of the rubbish was burned. Near the last of December the three children were taken sick with scarlet fever."

The germs of this disease are by no means of so weak and fleeting a nature that they lose their power and virulence as soon as they issue from the system of one infected with the disease. Not only may the disease be contracted without any personal contact between an exposed and an infected person, but, in the case above cited, a family was attacked by a contagium six years old. The evidence is that the germs of scarlet fever will linger in the bedding, the drapery or the paper on the wall, in the hair and clothing of the patient, be carried a long distance by letter, cling to the washtub where the garments were washed, or the playthings used by the patient; in garments packed away in a trunk, or rags in the attic, as fierce and dangerous after years of rest as at the moment when they emanated from the infected person. The safety of the people lies in thorough disinfection; and the most practicable way to disinfect rooms, clothing, etc., is to burn sulphur in quantities at the rate of about three pounds to each one thousand cubic feet of air space in the room in which the articles to be disinfected are spread out and freely exposed to the fumes.

#### PERIOD OF INCUBATION OF SCARLET FEVER.

As the disease germs may thus linger in the clothing and hair some time before being introduced into the system, it is difficult to determine the exact period of incubation.



Of the forty-seven health officers who made special final reports, only twenty-six stated definitely the period of incubation. Of these twenty-six, four had observed seven days as the period of incubation; nine placed the period between two and seven days; three reported nine days; one, seven to nine; two, ten days; one, five to ten; one, five to eight; one, three to eight; one reported twenty-one hours "from the arrival of the patient who was convalescing from the disease before the first case appeared;" one placed the period at fourteen days; one from "less than seven to twenty days;" another seven to twenty-one days.

Dr. John S. Caulkins, health officer of Dryden township, reported:

"My theory is that case No. 2 contracted the disease by kissing case No. 1, while case No. 3 undoubtedly took the disease by sleeping in the same bed with case No. 2. This would make the period of incubation in each case seven days. This is the shortest period ever observed by me in cases where all other sources of exposure could be certainly excluded."

When the death of a person who has died from scarlet fever, diphtheria, or small-pox is announced in print, the notice should state the cause as "from scarlet fever," diphtheria, or small-pox, as the case may be, to prevent attendance at the funeral or visits to the house.

About 10,000 pamphlets issued by the State Board of Health on the "Restriction and Prevention of Scarlet Fever" were during the year 1884 sent in small lots to the different localities where scarlet fever prevailed. These pamphlets the health officers were requested to distribute to the neighbors of those sick with the disease, and they have been pronounced by health officers "a great help in restricting the spread of the disease." As a law cannot be enforced unless public sentiment is "behind the law," so the efforts of health officers at isolation and disinfection are rendered to a great extent profitless without the cordial coöperation of the people. Toward securing this coöperation, liberal use has been made of the circulars issued by this Board, and, it is thought, with very satisfactory results.

## SMALL-POX IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1884.

There were in Michigan, during the year ending Dec. 31, 1884, four distinct outbreaks of small pox, in five townships, cities, and villages, in which there were twenty-two cases, with three deaths. During the previous year small-pox was reported in eight localities,—twenty-nine cases, with two deaths. The report of the outbreaks during the year 1883 may be found on pages 104-107 of the annual report for that year.

The following table shows the localities where small-pox was reported, the number of cases and deaths in each outbreak, the dates when the first and last cases occurred, and the period of incubation, as stated by the health officers in their final reports.

TABLE.—*Stating localities where small-pox was reported in the year 1884, the number of cases and deaths in each outbreak, the month and day of month when the first and last cases occurred, and the period of incubation, as stated by the health officer:*

Localities.	Small-pox.		First and Last Cases in 1884.	Period of Incubation.
	Cases.	Deaths.		
Bath, Clinton Co. ....	4	0	Feb. 11—Feb. 26. ....	{ 3 cases, 15 days. 1 case, 14 days.
Detroit, Wayne Co. ....	1	0	May 4. ....	.....
Rose Lake, Osceola Co. ....	13	2	June 8—July 1. ....	{ Shortest period, 17 days. Longest period, 21 days.
LeRoy, Osceola Co. ....	1			
So. Boardman, Kalkaska Co. ....	3	1	Nov. 30—Dec. 17. ....	{ 2 cases, 13 days. 1 case not over 19 days.
Total in 5 localities. ....	22	3	Feb. 11—Dec. 17. ....	Av. period, about 16 days.

All the outbreaks during the year 1884 were traced to their probable source of contagium outside of the State. The details are given in connection with each outbreak.

#### THE BATH OUTBREAK.

February 12, 1884, information reached this office from Dr. A. R. Hicks, health officer of Bath township, Clinton county, that a case of small-pox had been discovered in that township, taken Feb. 10, 1884. Documents on the restriction and prevention of this disease were at once sent to the health officer of Bath township for distribution to neighbors. Information of this outbreak was also conveyed to the health officers of the neighboring townships of DeWitt, Williamston, Lansing, and Woodhull, asking them to be on the watch for the disease, also sending them pamphlets on the work of health officers and on "The Restriction and Prevention of Small-pox." In response to one of these letters G. W. Topping, M. D., health officer of the township of DeWitt, writes, under date of Feb. 14, 1884:

"I have written to the health officer of Bath enquiring about the location of the patient and the extent of the exposure, etc. If occasion calls for it I will ask a meeting of our board and action to authorize free vaccination and such other means as the occasion may demand to prevent the spread of the disease."

This outbreak in the township of Bath did not spread to any other township, and in fact was restricted to the one family where it first appeared. There were in all four cases and no deaths.

#### SOURCE OF CONTAGIUM.

Concerning the source of contagium the health officer writes that the patient was taken sick on his return from New Orleans.

"The pains in his bones and back, accompanied with fever, began fourteen days after his discharge from Charity Hospital, New Orleans (Dr. Bland, Surgeon-in-chief), where he was being treated for dysentery." "The first pustules made their appearance as papules on his forehead and hands sixteen days from the date of his discharge from the hospital." The patient stated that from six to ten persons were dying daily from small-pox in New Orleans when he left. Information of the alleged source of this outbreak was at once conveyed from this office to the President of the State Board of Health of Louisiana.

#### MEASURES TAKEN TO RESTRICT THE SPREAD OF THE DISEASE.

Feb. 16, 1884, Dr. A. R. Hicks reports concerning measures that were taken to restrict the spread of the disease as follows:

"Isolation of those in any way exposed has been ordered, and with one exception will doubtless be carried out. One man refuses to stay at home from the eighth day of his exposure to the seventeenth day, and I have notified him that if he does insist on coming out I will proceed to the extremity of my power."

"Concerning vaccination there is more than the usual desire on the part of all unvaccinated to secure the benefits derived from the vaccine virus, and those who were vaccinated over seven years ago are also demanding vaccination. My opinion is that the general distribution of the literature sent from your office to me has educated the people in this direction. The families where the pamphlets and circulars are known to be read are the most intelligent, and respond the more readily to the requirements of the laws restraining contagious diseases. Therefore I say let the dissemination of knowledge go on until all the people know how to avoid contagion and how to prevent the spread."

#### A CASE OF SMALL-POX AT DETROIT.

May 4, 1884, J. H. Rouse, M. D., reported concerning a case of small-pox in the city of Detroit, as follows:

"It is reported that some two and a half weeks ago a man died at the house where this family was staying, at Point Edward, Canada, of German measles,—now supposed to be small-pox. It is reported that quite a number have been exposed to the contagium here, as the case was supposed to be chicken-pox."

This case was reported by the health officer as having recovered during the week ending May 24, 1884. No other cases were reported at Detroit during the year 1884.

#### THE OUTBREAKS IN THE TOWNSHIPS OF ROSE LAKE AND LE ROY, OSCEOLA COUNTY.

June 18, 1884, information reached this office from W. J. Law, M. D., health officer of the township of LeRoy and afterwards health officer of the village of LeRoy, of a case of small-pox in the township of Rose Lake, in close proximity to the village of LeRoy. Documents on the restriction and prevention of this disease were at once sent to the health officers of these and neighboring townships.

#### SOURCE OF CONTAGIUM—ROSE LAKE OUTBREAK.

Dr. W. J. Law writes July 14, 1884, as follows:

The patient first taken sick "says that he left Bremen, Germany, May 22, 1884, at ten o'clock A. M., for New York, and, on his trip, there were three children and one gentleman who died, one child near his berth. On asking what the child died of no answer came, nor did he hear. He says further that sulphur was burned two or three times on nearing New York. When landed, on going from the vessel he left a satchel for a few minutes, and, on returning for it, he was forbidden from coming on board; but he went and got the satchel, and while on board the sulphur fumes were so great as to almost suffocate him before he came out. He arrived at New York June 4, 1884, and started for LeRoy, Mich., June 5, 1884. He came by the way of Rochester and Buffalo to Detroit, then by the Flint & Pere Marquette R. R., was carried by mistake to Ludington, came back the following day to Reed City, then up to LeRoy, arriving on June 9, 1884. He was taken sick while on the route the eighth of June, but had been feeling bad for a day or two. He called in a physician on the tenth, but it was some time before the case was noticed or diagnosed as small pox. \* \* \* I have since found out that the clothes which he wore on board the vessel were not changed. He wore them all the way here and had on some of them when Dr. B. was called to prescribe for him. \* \* \* I think it will be a difficult matter to determine to a certainty from which source Dr. B. took the disease,—whether from the clothing or from the person of the German immigrant. I am convinced of one fact and that is that the captain or whoever had the vessel under management was, as I consider, almost criminally careless in allowing passengers to leave without disinfecting their clothing."

July 3, 1884, notice was sent to the National Board of Health and the health officer of the Port of New York, of the introduction of small-pox into this country by the Steamer Weser. In answer to one of these communications a letter, dated July 18, 1884, was received from the health officer of the port of New York, Wm. M. Smith, from which the following is an extract:



"The record of the S. S. Weser I find to be as follows—arrived June 4, 1884, with 802 steerage passengers—1 case of measles in a child of five years. The surgeon reported one death at sea, a child of one year, of *Tabes Mesenterica*. No other case of sickness was reported, nor was there any found, or evidence of there having been any, when the immigrants were inspected. This inspection is made by having the passengers pass in single file with heads bare before the boarding officer.

"It is undoubtedly one of those cases in which the contagion was received before embarking, and passed the quarantine here while yet latent. Seven hundred and sixty-two of the 802 passengers were vaccinated on board."

#### MEASURES TAKEN TO RESTRICT THE SPREAD OF SMALL-POX.

Before the establishment of any hospital complaint was received at this office that one man was allowed to go about freely unvaccinated after being exposed. The authorities of the village were urged to take proper restrictive measures.

The health authorities of LeRoy village had neglected to appoint a health officer for this year because they thought they would "save a health officer's salary by doing without one." On the discovery of this case Dr. W. J. Law was appointed health officer. The townships of Rose Lake and LeRoy united in the construction of two hospitals, which were built June 29. Under date of July 2, 1884, Dr. Law writes as follows concerning the removal of a patient from LeRoy to this hospital by the attendants at the hospital:

"We had in the morning issued orders that between five and seven o'clock all business and private houses should be closed and all persons should be off the streets. In fact we took every precaution we thought necessary, even to have a guard go ahead that none should meet the patient. In the patient's house there were three others that went to the hospital with him. \* \* \* When we ascertained that Dr. B. was sick I sent one of those pamphlets over and also gave orders what should be done with the discharges, etc., but it appears they did not pay proper attention. Then we gave further orders and that time they were followed out. I also had disinfectants sent there and did all I could (with public sentiment rife against sanitary duties) that lay in my power. Those documents you sent I took pains to distribute where I thought they would be read and made use of to the best advantage. Just here I might say that I can use some more of them throughout my rides in the country."

On July 3 information was received at this office from the health officer, Dr. W. J. Law, and the president of the village of LeRoy, J. E. Bevin, that the local physicians had difficulty in getting vaccine virus. A telegram went from this office to Dr. E. L. Griffin, Fond du Lac, Wis., on July 3, as follows: "Send two hundred points virus and bill to Dr. W. J. Law, LeRoy, Osceola County, Mich. Reply." To which the following reply was received on the same day: "One hundred sent to-day; will send one hundred more to-morrow."

Bryan Monaghan, health officer of the township of Rose Lake, writes, under date of Sept. 8, 1884, concerning precautionary measures, as follows:

"We have disinfected everything about the place and burned about forty pounds of sulphur in the house—main part 16 by 24, wing 16 by 24. I believe everything is safe. The entire cost is about fourteen hundred dollars, which the health authorities of New York City should pay."

There were in this outbreak 14 cases with two deaths, all of whom, with the exception of the physician attending the first case, were members of two families residing in one house.

A letter, dated July 1, 1884, was received from J. W. Ransom, M. D., health officer of the township of Burdell, stating in substance as follows:

Small-pox is present in the townships of Rose Lake and LeRoy. Many citizens have been exposed to it, and to prevent its spread the board of health of our township has forbidden all travel into or through our village of any from the infected district. There are some parties who defy all regulations. Please advise us as to our power in the case.

A letter went in reply giving the section of the law (section 1695 of compiled laws of 1871: Sec. 1636 of Howell's Annotated Statutes), from which the authority of the township board of health in the case was derived, and stating

that any person violating regulations of the board of health, made in accordance with this section, might be prosecuted for the penalty, and that it was important that notice should be given of the regulations as required by law.

It was reported that there were five cases of small-pox at Tustin, in the township of Burdell. Documents were sent from this office, but no reply was received.

#### THE OUTBREAK AT SO. BOARDMAN (BOARDMAN TOWNSHIP) KALKASKA COUNTY.

Dec. 8, 1884, a letter was received from Dr. O. P. Askam, health officer of Boardman township, reporting a case of small-pox taken sick Nov. 30, 1884. The last case in this outbreak occurred Dec. 17, and there were in all three cases with one death.

The grandmother of the child first taken sick had arrived at Boardman from Denver, Colorado, nineteen days before the child came down with the disease. Under date of Jan. 12, 1885, Dr. Askam writes as follows:

"The trunk brought from Denver, Col., was unpacked the night she came. The little fellow (first taken sick) handled most all of her things. \* \* \* There was no other way for the child to be exposed, as he had been nowhere away from home, and his parents had not been away from here for months."

And also in a letter, dated Dec. 21, 1884, Dr. Askam writes:

"There were cases of small-pox in Denver at the time she was there, but she was not with or near any cases that she knows of, and so far she is free from the disease. She is here on a visit only. Came direct from there here. I think that is her home."

The mother of the child had varioloid, taken Dec. 13. The grandmother did not have the disease. The case which proved fatal was the mother's brother. Concerning this case Dr. Askam writes, under date of Jan. 12:

"He was exposed by going in the house where the little patient was sick. He went there Dec. 4 stepped inside the door, looked at the child, and immediately went away. He was not in or near the house after that, and Dec. 17 he came down with the disease and died Dec. 30."

#### MEASURES TAKEN TO RESTRICT THE SPREAD OF THE DISEASE.

A letter, dated Dec. 22, 1884, was received from a citizen of South Boardman, in which the writer says:

"By request of some of the prominent citizens of this place I beg leave to lay before you the action of the board of health of the township of Boardman in the matter of small-pox cases." [The letter contained a diagram of the buildings where small-pox occurred and neighboring buildings. After stating the situation of the first case in a family over a dry-goods store the letter continued:] "A young man boarding at the hotel directly opposite the building where they had had the disease was taken sick on the seventeenth inst., and on the twentieth the attending physician pronounced it a case of small-pox, and by direction of the board of health he was removed across the street into the building where the first cases were. The people protested against the removal and against making a pesthouse in the most thickly populated portion of the village, but to no avail. The patient was removed in the day time without even giving warning to people on the street. A suitable building in a proper locality could have been procured. Several of the inmates of the hotel were exposed and are allowed to go about town whenever and wherever they please. \* \* \* The person employed by the board to wait on the small-pox cases goes to the house several times a day and opens the door each time and receives and gives to the attendants inside such things as they require."

During the temporary illness of Dr. Askam, at Cadillac (not with small-pox as was at first supposed), W. H. Leach was appointed temporary health officer.

Dr. O. P. Askam, health officer, writes as follows Dec. 21, 1884, concerning the restrictive measures taken:

"When the boy was taken I did not discover it in time to remove him, and as the next one sick was his mother I deemed it proper to keep it in the one house; and thinking we would have no more cases the board of health did not provide a pest house, and when the last case was taken at the hotel, as the patient was a brother of the second case taken sick and requested to be taken to her house, and as we had no hospital, I could do no better than remove him there at once. \* \* \*

I have thoroughly disinfected and ventilated the hotel and have my patients strictly close, as I have done from the first. We now have a pest house and I will do all in my power to restrict the spread of the disease. I give you this information at length because I wish to know if I was justified in doing as I did, which was at the order of the board of health."

The following letter was sent from this office in reply to the above communication:

MICHIGAN STATE BOARD OF HEALTH, }  
OFFICE OF THE SECRETARY,  
Lansing, Michigan, December 24, 1884. }

*O. P. Askam, M. D., Health Officer, South Boardman, Michigan:*

DEAR SIR,—Please accept thanks for your letter of Dec. 21 relative to small-pox in South Boardman, and for the enclosed weekly report. At this distance I am, of course, unable to judge of the advisability of the action of your board. If any persons have been exposed they should be vaccinated at once and should be compelled to stay at home until the incubation period is passed. If they come down with the disease and can safely be removed they should be at once transported to a suitable pest house away from the main part of the town, and great care should be used not to expose others in transit. The sick should be thoroughly isolated; disinfection should be rigid, and free vaccination urged on the community; no one should be with the sick except doctor and nurses, and those who carry food and other necessities to the sick should be warned to use the greatest care not to handle anything from the pest house or breathe its air, in order that they may not carry infection to the well.

In your final report I would like dates of each case. If other persons come down with the disease, please let me know at once.

Very respectfully,  
HENRY B. BAKER, *Secretary.*

In his final report dated Jan. 8, 1885, Dr. Askam reports as follows concerning precautionary measures taken:

"The cases were isolated completely; free vaccination was offered the people and everything was disinfected with sulphur and carbolic acid. On the death of the young man he was buried the same night. The whole town was disinfected by burning sulphur, the things in the house were all burned and the family was removed to the pest house."

#### SMALL-POX NOT FOUND WHERE REPORTED.

In the following localities small-pox was reported to be present, documents were sent from this office, and the report was subsequently found to be incorrect: Cadillac, Wexford county, December, 1884, (supposed case, Dr. Askam, from South Boardman); Kalkaska, Kalkaska county, July, 1884; Hobart, Wexford county, July; St. Louis, Gratiot county, May, 1884; Orleans, Ionia county, December, 1883, and January, 1884; Birch Run, Saginaw county, October, 1884.

#### PERIOD OF INCUBATION.

As will be seen in the table given on page 278, the period of incubation was found to vary from 13 to 21 days.

#### WHEN MICHIGAN WAS FREE FROM SMALL-POX.

As will be seen from the table given on page 278, the State was free from small-pox during the months of March, April,\* August, September, and October.

#### PAMPHLETS DISTRIBUTED.

During the year 1884, about 1,800 pamphlets, issued by the State Board of Health, on the "Restriction and Prevention of Small-Pox," were sent from this office for distribution in localities where the disease prevailed and in neighboring localities. There were also sent out about 700 of these pamphlets translated into the German and the Holland languages.

\*The case at Detroit which was reported by the health officer as taken sick during the week ending May 10, 1884, was reported on the postal card report of disease, sent by Dr. Rouse, for the week ending May 3, and is included in the reports stating presence of the disease for the month of April, 1884, in the compilation of the weekly reports for that year.



"The families where these circulars are known to be read" are reported by health officers to "respond more readily to the requirements of the laws restraining contagious diseases."

One copy of this pamphlet (in the English language) was sent to the health officer of every township, city, and village in the State during the year 1884 where the name of a health officer had been returned to this office. In case no health officer had been returned the pamphlet was sent to the supervisor. There were distributed in this manner between fourteen and fifteen hundred copies.

Nov. 7, 1884, at the request of L. C. Hull, Principal of the High School, Detroit, 200 copies of these pamphlets were sent to him for use of the pupils in physiology and hygiene. Other documents (200 of each) were sent at the same time on the "Contagious Diseases," "Restriction and Prevention of Scarlet Fever," and "Restriction and Prevention of Diphtheria."

Copies of these documents have also been sent for distribution to professors in other schools who have requested them, and this is thought to be a valuable method of disseminating information and securing the "co-operation of the citizens in preventing the spread of disease."

#### TYPHOID FEVER IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1884.

Beginning about October 1, 1884, the method was adopted of communicating with health officers immediately on the report of the occurrence of typhoid fever,—calling attention to the necessity of disinfecting the discharges from the bowels of all patients sick with that disease; examining into the subject of its relation to the water-supply with a view to guarding against further cases, stopping its use if necessary. This work was begun at that time because of the similarity of the methods of spreading typhoid fever and cholera. It seemed important that health officers throughout the State should become familiar with methods of restricting and preventing those diseases. A circular [64] issued by the State Board of Health on the work of health officers, having a paragraph concerning typhoid fever marked, was also sent; which paragraph is as follows:

TYPHOID FEVER is believed to be a disease often communicated by means of water or milk contaminated with the discharges from typhoid fever patients or with the remains of those who have died from the disease. Hence typhoid fever might often be prevented by a thorough disinfection of such discharges, and by requiring that those who have died from the disease shall be buried entirely away from all sources of water-supply, and by condemning sources of water-supply already thus contaminated.

There was also sent a circular [47] on the "Contagious Diseases," having the paragraph relative to disposal of discharges marked.

A paper by Prof. Henry F. Lyster, A. M., M. D., member of the State Board of Health, on the "Limitation and Prevention of Typhoid Fever" [Reprint No. 197], was also sent with the other documents sent to health officers on the report of a case of typhoid fever.

As yet the reports received concerning this disease are not so complete and perfect as those received concerning scarlet fever, diphtheria, and small-pox. This is probably in part due to the short time that this office has been in communication with health officers concerning typhoid fever outbreaks, and some

do not know that it is necessary to report such outbreaks. Again, the method of spreading this disease is so different from the usual method of spread of diphtheria and scarlet fever that health officers have not been so successful in tracing the source of contagium, and consequently in very few cases have they been able to state definitely the period of incubation. Possibly cases and even deaths from typhoid fever have not been reported because they have been styled by attending physicians as "malarial" or "typho-malarial" fevers. In some instances local health authorities have received from the office of the State Board of Health their first knowledge of the existence of typhoid fever in their jurisdiction, said information having been received at this office from physicians in other townships, newspapers, and other sources. Health officers have, as a rule, been quick to act on the receipt of such information. As an illustration of letters sometimes received from health officers, the following is printed:

PRAIRIE RONDE, November 5, 1884.

*Henry B. Baker, M. D., Secretary of State Board of Health, Lansing, Mich.:*

DEAR SIR: Please accept thanks for notice of typhoid fever in my jurisdiction. I knew nothing of the case until notice came from your office dated October 27, 1884. Will send you weekly reports hereafter.

JAMES NESBITT, *Health Officer.*

There were reported during the year ending December 31, 1884, 969 cases of typhoid fever with 290 deaths in 245 localities. Typhoid fever was reported at the time of its occurrence in forty-four localities. The cases and deaths in the remaining 201 localities are taken from the annual reports of health officers and clerks made at the close of the year. As in five instances the health officers only reported the number of deaths from typhoid fever, no record being sent of the number of non-fatal cases, the per cent of deaths to cases, 30 per cent, as seen from the above figures, would be over large. Subtracting from the above figures the 40 deaths where non-fatal cases were not reported, the figures would be: 929 cases; 250 deaths; per cent of deaths to cases, 27.

#### SOURCE OF CONTAGIUM.

Forty-nine of the health officers and other officers, who reported typhoid fever present, did not state the source from which the disease was derived, and one hundred and nine stated that the source was unknown. Dr. L. W. Gardner, health officer, Harbor Springs, writes: "The disease has traversed nearly the whole county and it seems very difficult to determine the true cause." Five reported that the disease was caused by overwork and exhaustion; three, decaying vegetables in cellar; one, vegetable decomposition; one, animal decomposition. Other reports were received as follows: "Sporadic," "exposure to heat," "hot, dry weather," "low temperature and dry weather," "lived in swamp," "working in swamps," "bathing in impure or stagnant water," "working in water at Saginaw," "old or stagnant water in millpond," "exposure to wet and cold," "probably badly ventilated schoolhouse," "decaying slats and sawdust," "foul sink hole," "endemic." Eight reported filth to be the cause of the disease; four said defective drainage. In eleven instances the disease was reported to have been contracted in some other township, city, or village. Dr. W. H. Budd, health officer of the village of Sheridan, Montcalm county, writes: The patient "visited a young lady residing some few miles out of this district who afterwards died of typhoid fever." One reporter writes: "The first case (a man) came to the hotel with typhoid fever. Two inmates were taken sick." Another reports: "The

first person sick is a young man who came here sick from the State of Arkansas. \* \* This disease seems to be of a contagious nature."

Twenty-nine reporters (health officers and clerks) reported the source of contagium to be caused by "impure drinking water," "foul well," "infected well water," "bad water, foul privy vaults, and crowded tenements," "impure water in all cases," "all used water from a well around which rubbish and slops had been deposited," "well contaminated from privy and surface water," etc.

December 1, 1884, J. B. Martin, M. D., health officer, Cedar Creek, Mich., made a special final report to this office relative to typhoid fever, seven cases and two deaths, in which he stated that the disease was caused "from using impure water from a well badly contaminated by dead rats and toads that were found on cleaning." On the receipt of this important report it seemed a favorable opportunity to gain valuable information as to the causation of typhoid fever. A letter went from this office to Dr. Martin, asking the following questions:

1. When was the well cleaned out?
2. When was the use of its water discontinued?
3. What animals and what vegetable substances were found in the well, and in what condition of decay?
4. When was each person taken sick? Give exact dates if possible.
5. What physicians treated the cases? Give full addresses if possible.
6. Give the date of death or recovery of each case.
7. Were there any cases of typhoid fever in the vicinity this year prior to the outbreak mentioned by you?
8. Did the first person sick frequently or habitually use the water of the bad well?
9. Can you determine up to what date he (first person sick) used it?
10. Had he been away from home within three or four weeks of the time he was taken ill, or did he during this time drink of the water from other wells?
11. Was each of the other persons a user of the water of the bad well?
12. How long time intervened between the abandonment of the use of the well water and the inception of the disease in these persons?
13. Where were the excreta of the first patient thrown?
14. How deep is the well and how much water is in it now, or at the time of sickness?
15. What is the character of the well-wall? Brick, plank, stone, etc?
16. What is the nature of the soil about the well? Sand, gravel, or clay?
17. Is the location of the place high and dry or low and damp?
18. How near the well (feet or rods) is the family privy?
19. How long has the privy been in use, and what is its condition?
20. Is the water of the well now in use?

Under the date of January 27, 1885, Dr. Martin answered these questions as follows:

1. The well was cleaned out about Oct. 24, 1884.
2. The use of the water was discontinued Oct. 14.
3. Rats, mice, and rotten wood very badly decomposed and decayed.
4. No. 1, Sept. 15, 1884; No. 2, Oct. 8; No. 3, Oct. 13; No. 4, Oct. 17; No. 5, Oct. 21; No. 6, Oct. 20; No. 7, Oct. 25, 1884.
5. Cases Nos. 1, 5, and 6 were treated by Dr. J. C. Bostwick, Manton, Mich.; Nos. 2, 3, 4, and 7 by myself.
6. Date of death or recovery of each case: No. 1 died Oct. 4; No. 5 recovered Nov. 1; No. 6 died Nov. 27; No. 2 recovered Nov. 20; No. 3 recovered Dec. 2; No. 4 recovered Dec. 30; No. 7 recovered Jan. 5, 1885.
7. I had four cases in Liberty township, four miles north and east of Manton. They all ran a mild form; average time of fever 17 days; all recovered. One case southwest of Manton, in the township of Colfax, male, age thirty, time of fever 29 days, recovered. Could not find cause of fever in any of the cases.
8. He boarded at the hotel where they used the water.
9. To Sept. 30, when he was moved.
10. He had not been out of town, but drank from other wells, had been working at his trade (mason).



11. They were users of the water of the well.
12. Eight or ten days.
13. Do not know where the excreta of the patient were thrown.
14. About ten feet deep, three feet of water.
15. The well is planked.
16. Sandy soil.
17. A little lower than the average.
18. Thirty feet from privy.
19. Eighteen months, and quite bad.
20. At the present time they are using the water.

The people who ran the hotel were very careless, throwing slops, washing water, etc., out of the back door very close to the well.

The hotel barn is quite close to the well, 30 or 40 feet.

As will be seen from the foregoing questions and answers, all the persons sick with typhoid fever were users of the water of the bad well, only eight or ten days intervening between the abandonment of the water from this well and the inception of the disease in the person last taken sick. This well, found on cleaning to be filled with rats, mice, and rotten wood very badly decomposed and decayed, was only ten feet deep, with three feet of water, surrounded by a sandy soil, situated thirty feet from a privy which had been in use eighteen months and was "quite bad," and thirty or forty feet from the hotel barn. It is not learned that, before the first case was taken sick, the well had become infected by the specific discharges from the bowels of a person sick with typhoid fever; otherwise the circumstances were indeed favorable for an outbreak of that disease among those who drank the water.

Dr. S. D. Holcomb, health officer of Southfield, Oakland Co., reported concerning an epidemic of typhoid fever in two dwellings "situated very close together in rather a damp locality" as follows:

"On examination I found small digouts under the houses planked and bolstered up by old timbers for cellars, and the wells situated in the cellar bottoms and built by sinking one barrel on top of another. I found the barrel staves very much decayed, so much so that they would scarcely hold together, also the planking of cellar. I at once ordered the discontinuance of the use of the water, filling this up, and thoroughly ventilated the so constructed cellars. More or less sickness has prevailed there for the past two or three years, and it is quite evident all originated from this impure water and miasmatic air from the excessive decomposing vegetable matter."

#### PERIOD OF INCUBATION.

Very few facts were reported bearing upon this important question. One health officer stated the period of incubation to be three weeks, but did not state what was the source of the disease. Another writes "The first case was taken sick Sept. 18, and died in 21 days. Eight days after death the second boy was taken, and was sick for five weeks and recovered." Just how the second boy contracted the disease there is no evidence to show; but as the discharges from the first case were burned and disinfection practiced, it was probably from the same source as was the first case, and the "eight days" has no significance as a period of incubation.

#### TYPHOID AND TYPHO-MALARIAL FEVERS.

In some cases there seems to have been doubt as to the nature of the disease. J. W. Caughlin, M. D., health officer of Bay City, writes, Nov. 18, 1884:

"The fevers I have seen here are certainly not genuine enteric fever as it is described, and what I have seen in other places. I have never yet seen an eruption in one of them. Some have the bowel complaints characteristic of typhoid while others have not, but some of them approach very nearly to typhoid. They are usually called typho-malarial by the physicians here. The mortality from that class of fevers here has been very low, nearly all the cases having recovered. I have been here five years, and I have noticed that each year the fevers are more continued and resemble more nearly typhoid fever. The fevers I first saw here were more of the remittent character. There are other physicians here who will bear me out in what I say. I do not regard typhoid fever

as contagious, but it certainly is communicable. There is no question but what is termed typho-malarial fever is also communicable."

Dr. C. H. McKain, health officer of Vicksburg, reports, Oct. 20, 1884:

"I have been somewhat at a loss as to the class to which they belong, but that typhoid symptoms were present I am very certain."

R. A. Martin, M. D., health officer of Albion, reports concerning five cases and three deaths from a disease which was supposed to be typhoid fever, as follows:

"The diagnosis is not entirely satisfactory to any of the attending physicians, but typhoid fever perhaps comes the nearest to covering the cases."

#### MEASURES TAKEN TO RESTRICT THE SPREAD OF TYPHOID FEVER.

Two health officers reported that the discharges from the patient had been disinfected. Five others reported that disinfectants had been used. One reports "discontinuing the use of the water and disinfecting thoroughly." In four of the instances where disinfectants were used the outbreak was confined to one case. One physician reports concerning 27 cases and one death under his observation:

"As the disease spread over a number of townships where I was in attendance it was very hard to use the proper measures to stop the spread of the disease, however measures were taken as directed in your reports sent me."

In many localities physicians have not yet become accustomed to report cases of typhoid fever to the health officer, as they should do because it is a disease "dangerous to the public health," and therefore should be reported as provided by law.

J. S. Rouse, M. D., health officer of East Saginaw, writes, Oct. 10, 1884, as follows:

"Do you consider it necessary to put up a sign or notice on the house where there is a case of typhoid fever? Would you require of the physician an immediate written report the same as in other contagious diseases?"

The following reply was sent to the above from this office:

"It is desirable that immediate reports be made to boards of health of cases of typhoid fever as well as scarlet fever, small-pox, etc. It is not so necessary to put up signs or notices on houses in which typhoid fever occurs, as it is to inspect the well water used by the family and be sure that it is not contaminated by fecal discharges of typhoid patients and to see that all discharges are promptly and thoroughly disinfected."

#### TYPHOID FEVER IN MICHIGAN DURING THE THREE MONTHS ENDING DECEMBER 31, 1883.

Heretofore the communicable diseases have been compiled for the fiscal year. A change is made this year to the calendar year. This leaves out the three months from Sept. 30, 1883, to Dec. 31, 1883. Inasmuch as this period contains an important outbreak of typhoid fever at Adrian, the facts concerning typhoid fever during this period are here compiled.

There were reported to this office during the three months ending Dec. 31, 1883, 94 cases with 28 deaths from typhoid fever in thirteen localities. Fifty-three of these cases with eight of these deaths occurred in Adrian, where the epidemic began during the month of September and continued into the year 1884. Correspondence was had at the time and has since been had with the health officer of Adrian and with attending physicians. The outbreak was thoroughly investigated by Dr. Henry F. Lyster, committee of the State Board of Health on epidemic diseases, and an account of the essential facts revealed by the investigation and by subsequent correspondence will be found on pages 104-106 of the Report of the State Board of Health for 1884. Dr. Lyster's

longer report of this outbreak (not, however, including all the cases revealed by subsequent correspondence) is printed on pages 36-47 of the Report of the State Board of Health for 1884. The following table states when each patient was taken sick, and when he or she died or recovered, the age of the patient, and whether or not the patient drank water from the contaminated well or was a pupil at the school where the bad well was, also the name of the attending physician, and other remarks bearing on the outbreak. With Dr. Lyster's report on pages 36-47, this table supplies most of the important facts upon which the conclusions on pages 104-6 were based.

TYPHOID FEVER AT ADRAIN, MICHIGAN, SEPT. 7, 1883, TO APRIL 1, 1884.

Name (Initials).	Date taken Sick.	Died or Recovered.	Date of Death.	Date of Recovery.	Mild or Severe.	Age of Patient. Years.
M. H. w	Sept. 7, 1883	-----	-----	Abt. Oct. 24...	Malignant...	6
P. D. w	Sept. 24	-----	-----	-----	-----	20 or 23
L. B. w	Sept. 27	Died	Oct. 8	-----	-----	11
A. H.*	Oct. 1	-----	-----	Abt. 17th day	Severe	8
E. W. p	Oct. 2	Recovered	-----	Abt. 17th day	Mild	9
H. B. p	Oct. 2	-----	-----	-----	-----	20
S. C. w	Oct. 5	-----	-----	21th day	-----	7 or 8
M. B. p	Oct. 6	-----	-----	Abt. 24th day	Severe	4½ or 7
M. S. p	Oct. 7	-----	-----	After Oct. 24	Mild	7
L. G. p	Oct. 7	-----	-----	-----	Severe malignant	7
L. B. p	Oct. 7	-----	-----	-----	-----	2½
A. H. w	Oct. 8	-----	-----	Abt. Nov. 5	Mild	7
A. B. p	Oct. 8	-----	-----	-----	-----	10
F. G. p	Oct. 8	-----	-----	-----	-----	8
H. S. w	Oct. 8	-----	-----	-----	Mild	9
L. G. p	Oct. 8	-----	-----	-----	-----	6 or 7
P. H. p	Oct. 8	-----	-----	-----	-----	6 or 7
M. S. p	Oct. 8	-----	-----	11th day	-----	7
M. R. p	Oct. 9	Died	Abt. 9th day	-----	-----	8
A. W. p	Oct. 9	-----	-----	-----	-----	7
C. J. p	Oct. 9	-----	-----	-----	-----	8
E. R. †	Oct. 14	Recovered	-----	Abt. 9th day	Mild	7
I. R. p	Oct. 10	-----	-----	-----	-----	17
P. R. w	Oct. 11	Recovered	-----	-----	-----	7 or 8
Mrs. W. H. w	Oct. 11	-----	-----	Abt. 16th day	-----	6
H. B. p	Oct. 14	Recovered	-----	-----	Severe	7
L. P. p	Oct. 19	-----	-----	Abt. 10th day	Mild	27
M. L. p	Oct. 16	Recovered	-----	13th day	-----	24
G. M. w	Oct. 17	Recovered	-----	Abt. Nov. 30	Severe	8
G. D. P. w	Oct. 17	-----	-----	-----	-----	8
Mrs. F. N. w	Oct. 19	-----	-----	-----	-----	26
C. S. p	Oct. 20	Died	-----	-----	-----	9
C. B. p	Oct. 21	-----	-----	-----	-----	11
F. N. w	Oct. 23	-----	-----	-----	-----	15
L. W.	Nov. 5	Died	Nov. 24	-----	-----	2
A. A. †w	Nov. 7	Died	-----	-----	-----	18
H. B.	Nov. 8	-----	-----	-----	-----	38
C. R. †	Nov. 13	Died	Nov. 23	-----	-----	36
H. wp	Nov. 19	-----	-----	-----	-----	-----
B.	Nov. 24	Recovered	-----	Fever subsided on 21st day	Mild	2
L. R. †	Nov. 21	Recovered	-----	Abt. 3 weeks	Severe	18
Mrs. B. B.	Nov. 27	-----	-----	In abt. 42 days	-----	Abt. 38
Mrs. S. S.	Nov. 28	-----	-----	Abt. 22d day	Ordinary	36
C. P.	Dec. 1	Died	Abt. 14th day	-----	Malignant	-----
E. P.	Dec. 4	-----	-----	-----	-----	-----
Mrs. M. P.	Dec. 13	-----	-----	-----	-----	12
G. B.	Dec. 15	-----	-----	Abt. 21st day	-----	8
W. S.	Dec. 19	-----	-----	-----	Ordinary	14
A. B.	Dec. 25	-----	-----	Abt. 28th day	Severe	6
L.	Jan. 1, 1884	-----	-----	Abt. 8th day	Abortive	-----
C. P.	Jan. 4	-----	-----	-----	Mild	42
A. B.	Jan. 7	Died	March 8	-----	-----	70
Mrs. H.	April 1	-----	-----	Abt. 22d day	Mild	-----

\* Pupil of German School on Frank street.

† Pupil of German School across the street.

‡ Not a pupil, and did not drink from the bad well.

w The letter "w" placed opposite any given name indicates that said person drank water from the contaminated well.

p This letter indicates that the patient was a pupil at the German Lutheran School where the bad well was, and where over one-third of the whole number of cases occurred.



As will be seen from the above table and the account given on pages 104-106 of this report over one-third of the cases in this Adrian outbreak were pupils at the school where the bad well was, and most of the others may have resulted from the the pupils carrying the infection to their homes, privies, and wells. Although it is not known how the first case in this outbreak contracted the fever, it seems to be established that the most of the succeeding cases resulted from the use of foul well-water after it had become infected from the specific discharges of a first case.

It is thought that in many outbreaks where the source is reported "unknown," diligent investigation would find some privy vault which had received the discharges of some first case, and some neighboring well into which these discharges have found admission, and from which people are innocently drinking the cause of typhoid fever which thorough disinfection at the proper time might have destroyed.

### MEASLES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1884.

There were reported in Michigan for the year ending Dec. 31, 1884, by all the reports received at the office of the State Board of Health (including letters, and blanks "L," "K," and "M," sent during the outbreak or just at its close, and the annual reports of clerks and health officers received at the close of the year), 2,178 cases of measles in 131 localities, an average of about fifteen cases to each locality. There were 33 deaths, that being only one death to every 66 cases. The foregoing statement does not include Detroit, from which city the number of cases and deaths from measles was not reported to this office.

#### SOURCE OF CONTAGIUM.

Eighty reporters (health officers and clerks) did not state the source from which the disease was derived. Twenty-two replied that the source was "unknown." Twenty reported that the disease had been introduced from some other locality, (in one instance from Evansville, Ind.; in one, from Chicago, Ill.; in another, from Canada). One reported that the children before being taken sick were on exhibition at a museum in Detroit for ten days. One reported that the disease was brought by "an organ peddler who stopped and stayed over night with the family." One health officer writes as follows: "A young man brought it here from the township east, going there, being exposed, coming back, and working in a public place he exposed a large number." Three reports stated that the disease "broke out at school." In one instance the outbreak was reported to be "sporadic."

#### PERIOD OF INCUBATION.

Dr. Charles N. Silsbee, health officer of Orleans township, Ionia county, reported the following facts bearing on the period of incubation: "The family were all exposed at the same time, but there seemed to be some difference as to the time that they were taken sick. The first case was taken sick Feb. 18, six days after exposure; the second, Feb. 20; and the third, Feb. 24."

## MEASURES TAKEN TO RESTRICT THE SPREAD OF THE DISEASE.

In some instances the patients were isolated. Two health officers reported "isolation of patient and placarding of houses." In each of these cases the outbreak was confined to the one family where it first occurred. Dr. A. W. Adams, health officer of the village of Bellevue, Eaton county, reports concerning an outbreak of 86 cases and two deaths during the months of March and April, 1884: "There were no measures taken to restrict the spread of the disease. The exposure was so general and the people so unprepared for any such effort that there was nothing done."

## RAILROAD TRANSPORTATION OF DEAD BODIES.

The following correspondence was had between this office and J. D. Marston, General Baggage Agent, Chicago, Rock Island, and Pacific Railway, relative to the transportation of dead bodies:

CHICAGO, ROCK ISLAND, AND PACIFIC RAILWAY, }  
OFFICE OF THE GENERAL BAGGAGE AGENT,  
Chicago, November 18th, 1884. }

*Secretary State Board of Health, Lansing, Mich.:*

DEAR SIR:—Will you please favor me at your earliest convenience with a copy of your rules and regulations governing the transportation of corpses in baggage cars.

There seems to be a wide diversity of opinion with the different State Boards of Health relative to what bodies may or may not be transported, and how they shall be prepared, etc.

The object of this enquiry is to enable a committee appointed by the National Association of General Baggage Agents to report a set of rules and regulations to govern the transportation of corpses in baggage cars, for the adoption of all the railroads in the United States and Canada.

Any suggestion you personally may be pleased to make will be thankfully received.

Yours truly,

J. D. MARSTON,  
*Chairman of Committee.*

MICHIGAN STATE BOARD OF HEALTH, }  
OFFICE OF THE SECRETARY,  
Lansing, Michigan, Nov. 20, 1884. }

*J. D. Marston, General Baggage Agent, Chicago, Rock Island, and Pacific Railway, Chicago, Ill.:*

DEAR SIR:—Your letter of Nov. 18 has been received. This board has published no special rules governing the transportation of corpses in baggage cars.

By this mail I send you two documents, each, on the restriction and prevention of "small-pox," "scarlet fever," and "diphtheria," and shall be pleased to send you more of these documents, as well as of the others which I send, if you desire me to do so. These documents contain the rules published by this board for the government of the people generally in this State as regards diseases "dangerous to the public health," but have no bearing on railroads other than the general one on all means of travel. You will notice from page 11 of document [64] that there are certain diseases which this board considers "dangerous to the public health," but not all of them are equally so. It would not be dangerous to transport the dead bodies of persons dying of some of these diseases. I have underscored in blue those diseases the dead bodies from which I should consider it dangerous to transport in the cars, and to that list I would add yellow fever and plague, but plague has never reached this country.

Please accept thanks for the printed circular of "rules for the guidance of station agents, etc.," which accompanied the letter.

Taking one year with another more danger results to the public from transporting the bodies of persons dying of either diphtheria or scarlet fever than from any of the diseases mentioned in your Rule 1. Typhus fever is also fully as readily spread as is any disease mentioned in your Rule 1. It is, however, a rare disease in this country. No danger would be likely to result from transporting typhoid fever cadavers; but it is just possible that danger might arise, so it might remain

in your Rule 2. But Rule 2 does not amount to much respecting the really dangerous diseases which I have named. Arranging these diseases in the order of greatest probable danger to the public from railroad and other transportation they will stand about as follows:

One, Asiatic cholera; 2, typhus fever; 3, scarlet fever; 4, diphtheria; 5, small-pox; 6, yellow fever; 7, typhoid fever.

If yellow fever is properly included in your Rule 1, then all the others named above (except typhoid fever) should by all means be included. If they are all put in Rule 2 it should be very materially amended. Specifying the strength of the carbolic acid would be important. Pure carbolic acid is a crystalline solid. A weak solution of carbolic acid is not a disinfectant.

Very respectfully,

HENRY B. BAKER *Secretary.*





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### ERRATA.

Page 193, last line, †, for *each station* read *all stations*.

Page 196, second paragraph, second line, for *page 218* read *pages 219-221*.

Page 199, fifth paragraph, first line, for *following pages 220 and 221* read *pages 222 and 223*.

Pages 201, 203, 204 in the \* footnote, for *page 218* read *pages 219-221*.

Page 202, in the ‡ footnote, for *page 218* read *pages 219-221*.

Page 207, in the † footnote, for *page 218* read *pages 219-221*.

Page 247, \*, second line, for *diarrhea* read *bronchitis*; third line, for *eight* read *five*.

Pages 253 and 255, at end of page head line, for *1883* read *1884*.













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Michigan. State Board of Health.  
Ann. Report.  
12th.

1884



